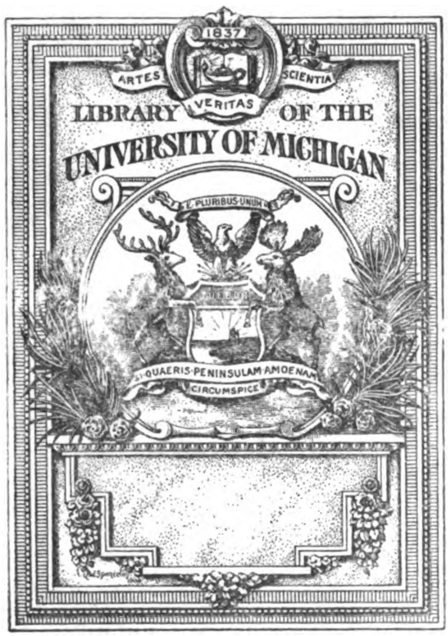
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INTERNATIONAL CLINICS

A QUARTERLY

OF

ILLUSTRATED CLINICAL LECTURES AND ESPECIALLY PREPARED ORIGINAL ARTICLES

ON

TREATMENT, MEDICINE, SURGERY, NEUROLOGY, PÆDIATRICS, OBSTETRICS, GYNÆCOLOGY, ORTHOPÆDICS, PATHOLOGY, DERMATOLOGY, OPHTHALMOLOGY, OTOLOGY, RHINOLOGY, LARYNGOLOGY, HYGIENE, AND OTHER TOPICS OF INTEREST TO STUDENTS AND PRACTITIONERS

BY LEADING MEMBERS OF THE MEDICAL PROFESSION THROUGHOUT THE WORLD

EDITED BY

HENRY W. CATTELL, A.M., M.D., PHILADELPHIA, U.S.A.

WITH THE COLLABORATION OF

WM. OSLER, M.D. OXFORD

JOHN H. MUSSER, M.D. PHILADELPHIA

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CONTRIBUTORS TO VOLUME I

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BOZEMAN, NATHAN G., M.D., Ph.B., New York.

BROOKS, NAT. P., M.D., Charleston, N. H.

CYRIAX, EDGAR F., M.D. (Edin.), London.

FLEXNER, SIMON, M.D., The Rockefeller Institute for Medical Research, New York.

FUNKE, JOHN, M.D., Professor of Pathology, Bacteriology, and Hygiene in the Atlanta College of Physicians and Surgeons, Atlanta, Ga.

HALD, P. TETENS, M.D., Privatdocent in the University of Copenhagen; First Assistant Surgeon, Ear and Throat Clinic of the Kommune-Hospital, Copenhagen, Denmark.

HAMMOND, LEVI J., M.D., Surgeon to the Methodist Episcopal Hospital, Philadelphia.

HILL, EBEN C., M.D., United States Army.

HOYT, DANIEL M., M.D., Philadelphia, Pa.

JOHNSON, LUCIUS W., D.D.S., M.D., Past Assistant Surgeon U. S. N.

JUDD, ASPINWALL, M.D., Adjutant Professor of Surgery, Post-graduate School and Hospital, New York City.

KOPETZKY, SAMUEL J., M.D., Visiting Otologist New York Red Cross Hospital; Surgeon (Ear Department), New York Nose, Throat, and Lung Hospital; Assistant Surgeon (Ear Department), Manhattan Eye, Ear, and Throat Hospital, New York, N. Y.

MUDGETT, J. H., M.D., Philadelphia, Pa.

SCHACHNER, AUGUST, M.D., Louisville, Ky.

DE SCHWEINITZ, G. E., A.M., M.D., President of the College of Physicians, Philadelphia, Pa.

Solomon, Meyer, M.D., Junior Assistant Physician, Government Hospital for the Insane, Washington, D. C.

Stevens, A. A., M.D., Lecturer on Physical Diagnosis in the University of Pennsylvania; Professor of Therapeutics and Clinical Medicine, Woman's Medical College of Pennsylvania; Lecturer in Medicine, University of Pennsylvania, Philadelphia, Pa.

Sutton, Howard A., M.D., Assistant Surgeon to the Methodist Episcopal Hospital; Assistant in Anatomy, University of Pennsylvania, Philadelphia.

Taylor, J. S., Surgeon, U. S. N.

Tobie, Walter E., M.D., Professor of Anatomy, Medical School of Maine; Associate Surgeon, Maine General Hospital, Portland, Me.

Walsh, James J., M.D., Ph.D., Sc.D., Dean and Professor of the History of Medicine and of Nervous Diseases at Fordham University School of Medicine, New York.

Watson, Edward W., M.D., Philadelphia, Pa.

Weber, F. Parkes, M.A., M.D., F.R.C.P., Physician to the German Hospital, London.

Wolbarst, Abr. L., M.D., Consulting Genito-urinary Surgeon, Central Islip State Hospital; Visiting Genito-urinary Surgeon, People's Hospital, West Side German Dispensary and Beth Israel Hospital Dispensary, etc., New York.

CONTENTS OF VOLUME I

(TWENTY-SECOND SERIES)

DIAGNOSIS AND TREATMENT

MEDICINE

SURGERY

DISEASES OF THE EAR

OBSTETRICS

OCCUPATIONAL DISEASES

EUGENICS

HISTORIC MEDICAL PLACES OF AMERICA

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LIST OF ILLUSTRATIONS TO VOLUME I

(TWENTY-SECOND SERIES)

Diagnosis and Treatment

ON THE METHODS OF DETERMINING THE SOURCE OF PUS AND SHREDS IN THE URINE, WITH SPECIAL REFERENCE TO THE AUTHOR'S "FIVE-GLASS CATHETER TEST"

BY ABR. L. WOLBARST, M.D.

NEW YORK

Consulting Genito-urinary Surgeon, Central Islip State Hospital; Visiting Genito-urinary Surgeon, People's Hospital, West Side German Dispensary and Beth Israel Hospital Dispensary, etc.

In the treatment of diseases of the male urethra, especially in chronic conditions, it is essential that a correct diagnosis be made as to the source of shreds and pus found in the patient's urine. It is a well-known fact that these inflammatory products may come from any portion of the urinary tract, and, if the quantity be not too great, they will in all probability be carried out in the first flow of urine voided by the patient, and misleading information will follow as to their origin.

The difficulties inherent in any attempt to determine the exact location of a lesion in the urinary tract by an examination of the urine and its contents becomes easily apparent when we remember that this tract is not, anatomically, readily accessible to diagnostic investigation. The matter is further complicated by the fact that the urethra is the only outlet for the urinary secretion of the kidneys, so that any effort to determine the condition of the kidneys by examining the urine must of necessity take into consideration the condition of the urethra; and *vice versa*, the diagnosis of urethral conditions may thus be complicated by the existence of lesions in the upper urinary tract.

Inflammatory products in the urethra will be carried out with the stream of urine, and, unless proper precautions are employed, may be the cause of an incorrect diagnosis, so far as the bladder, kidneys, and ureters are concerned. Sir Henry Thompson, in his classic work,[1] commenting on the possibility of such errors being made, relates the interesting case of a man who was being treated

for pyelitis. The man had sent his urine in a clean bottle twice each week to his physician to be examined, and because the physician found pus in the urine at each examination he concluded that the pus came from the kidneys; consequently, in view of corroborating symptoms, he treated the patient for pyelitis. This treatment continued for several months without any improvement. It was only when the patient passed his urine into two glasses that it was discovered that all the pus was in the first urine voided, and that the urine in the second glass was perfectly clear and free of pus. It was also found at the same time that the patient had had a persistent urethral discharge. Needless to say, the "pyelitis" soon cleared up under local treatment applied to the urethra.

Nevertheless, in spite of the many years that have passed since this incident was recorded, and the numerous contributions that have been made to our knowledge of the subject, the same errors are undoubtedly being made to-day, though not so frequently as in the past; it may therefore be not altogether amiss to take this matter up in detail.

For purposes of diagnosis, we may divide the urinary tract into two portions—an upper portion, embracing the kidneys, ureters, and bladder, and a lower, which includes the various subdivisions of the urethra. The lower tract, being intimately associated with the genital function, is more often the subject of inflammatory diseases, which have a strong tendency to chronicity. Hence the importance of determining the source of foreign products in the urine.

The simplest of all urinary tests, having this object in view, is that known as the Thompson two-glass test. Sir Henry Thompson was presumably the first to realize that considerable information could be obtained, particularly in cases of chronic gonorrhœa and prostatitis, by having the patient void his urine into two vessels. His idea was to flush the urethra of its foreign products by having the patient void a few tablespoonfuls into a glass, and then have him pass the remainder into a second glass. In this way he believed that the second urine, having passed over a cleansed urethra, could be relied upon in determining pathologic conditions in the upper urinary tract. This suggestion was undoubtedly a great step forward, in so far as it called attention to the possibility of isolating the *débris* contained in one part of the urinary tract from the clean urine which had not been permitted to come in contact with it.

It may be said, in passing, that this test is of great value for general purposes. In the consideration of urethral diseases, however, it has an inherent weakness in that it regards the male urethra as a single canal and does not recognize the anatomic entity of its anterior and posterior divisions. The compressor urethræ muscle, or external sphincter, divides the urethra clinically and anatomically into an anterior and a posterior portion. This division makes it possible to determine whether a urethral inflammation has been limited to that portion of the urethra anterior to the sphincter, or has extended beyond it into the deeper portion. Pus formed in the anterior urethra gravitates naturally towards the urinary meatus, and, if the inflammation has not passed beyond the sphincter, the posterior portion of the urethra will be uncontaminated with inflammatory products. Therefore pus or shreds lying in the anterior urethra will be swept out with the first stream of urine, and the urine passed into a second glass, coming through a flushed urethra, will be clear. Likewise, pus or shreds formed posteriorly to the sphincter will either remain in the prostatic urethra, or, if there be a considerable quantity, will gravitate backward into the bladder. Here they mix with the urine which has come down from the kidneys, and consequently the second urine passed will also contain pus or shreds.

In view of these facts, Thompson's original idea has been departed from considerably in general practice, so that at present it is applied almost exclusively in the diagnosis and treatment of urethral inflammation. The patient voids his urine into two glasses, and if the first urine is cloudy and the second clear, it is usually concluded that an anterior urethritis is present; if, however, the urine passed into both glasses contains pus or shreds, it is usually concluded that both portions of the urethra are involved in the inflammatory process.

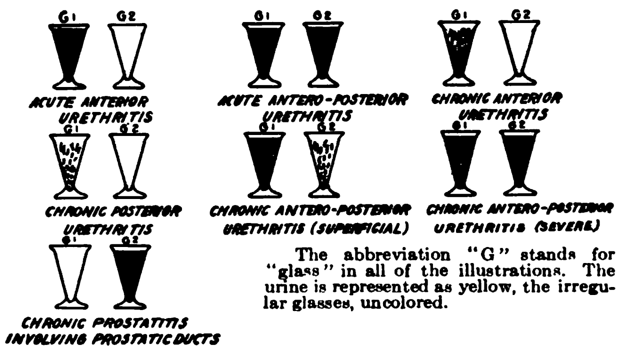
As a matter of fact, this reasoning is by no means correct, and serious error may result if it is strictly adhered to. In cases in which there is a copious secretion of pus in both the anterior and posterior urethræ, the test is sufficiently accurate for all practical purposes; but, on the other hand, in a case of chronic posterior urethritis or prostatitis, with little or no involvement of the anterior urethra, and with but slight secretion in the posterior urethra, the amount of secretion thus formed remains in the prostatic urethra

without dropping back into the bladder. In such a case the bladder urine remains absolutely clear.

If, now, the urine is passed into two glasses, the first glass will contain the secretion that was carried out with the first flow of urine, and the second glass will contain clear urine, the second urine having passed over the cleansed prostatic urethra. According to the strict reading of Thompson's test, the glasses in this case would indicate that the secretion came from the anterior urethra and that the posterior urethra was unaffected. This would manifestly be erroneous and misleading. Consequently, it is apparent that the greatest caution should be used in connection with this test, particularly in chronic cases (Fig. 1).

FIG. 1.

THOMPSON TWO GLASS TEST



The abbreviation "G" stands for "glass" in all of the illustrations. The urine is represented as yellow, the irregular glasses, uncolored.

See Fig. 7, page 14.

The two-glass test has been modified by the addition of a third glass. The readings are as follows: The first glass is said to contain the secretion of the anterior urethra, the second represents the secretion from the posterior urethra, and the third is said to represent the urine from the bladder. This is known as the three-glass test. When a fourth glass is added, that is, the patient passes his urine into a fourth glass, this urine is assumed to be the last urine in the bladder, which has been forced out by the contraction of the bladder neck and allied muscles. At the same time, it is assumed to contain the secretion from the prostatic ducts and follicles, owing to the spasmodic contraction of the internal vesical sphincter and the levator ani, which close down upon the ducts and glands and

empty them of their inflammatory products. This is known as the four-glass test.

We owe to Finger [2] the knowledge that emptying the bladder of its last drops of urine has the effect of squeezing the plugs and casts of inflammatory material that fill up the prostatic ducts and follicles into the prostatic urethra. Nevertheless, it is well not to place too much reliance on this observation, for while it may often be found correct, it is just as likely as not that the fourth urine passed may *not* contain the plugs that Finger speaks of. Very often the final drops of urine voided by the patient are perfectly clear, even in the presence of distinctly palpable prostatic and vesicular disease. The inflammatory products lie embedded in the ducts and glands, and no amount of bladder straining will force them into the urethra. Occasionally, even prostatic massage may fail to dislodge them. In these cases, not alone does the four-glass test fail in its purpose, but its findings are apt to be grossly misleading. It must be said, however, that at times we do get the expected result.

All of these modifications of the Thompson test, however useful they may be in routine practice, are open to the objection that they lack accuracy, in so far as they are dependent on theoretical considerations, rather than on mechanically correct bases. Consequently, they must be used with this knowledge in mind. Their greatest field of usefulness lies in their being employed in conjunction with the irrigation tests about to be described.

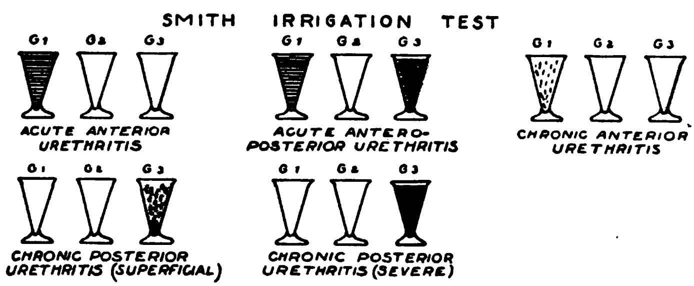
These irrigation tests are based on the fact that there are anatomic dividing lines between the anterior and posterior urethræ and the bladder, and that it is possible to cleanse thoroughly one portion of the urinary tract without disturbing the others. They are therefore far more accurate than the Thompson test and its several modifications.

In the simplest of these tests (Smith [3]), the anterior urethra is thoroughly washed out with plain sterile water or boric solution until the washings come out clear. The washing is continued in a second glass, which is retained as a control, to show that all the pus and shreds have been eliminated from the anterior urethra. The patient now voids his urine into a clean glass; if this urine is clear, we are certain that the inflammatory products are derived solely from the anterior urethra; if, however, the urine just passed is not

clear, we are equally certain that the pus or shreds must come either from the prostatic urethra or from the upper urinary tract (Fig. 2). It will be observed that there is no guess-work involved in this test. The findings stand out clear and unequivocal, if it has been done properly.

As with the Thompson two-glass test, this test has also been modified by the addition of one or two glasses for the urine. The readings of this test are the same, and the criticisms directed at their accuracy are equally strong. Thus, in the Kollmann five-glass test (Fig. 3), the anterior urethra is irrigated with a catheter and the washings collected in a glass. A second, or control, glass contains the clear washings, indicating that the anterior urethra is devoid of foreign products. The patient now voids his urine into three

Fig. 2.



See Fig. 7, page 14.

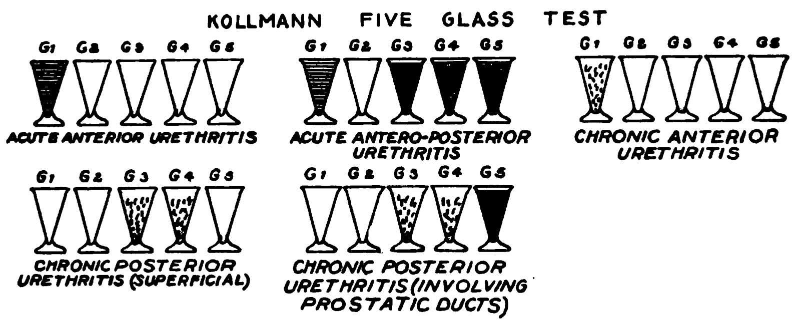
glasses. The third glass contains the shreds and pus lying in the prostatic urethra; the fourth represents the bladder urine, and the fifth glass represents the last drops of urine squeezed out of the bladder, together with the inflammatory material pressed out of the prostatic ducts and glands. This test is of considerable value in routine practice, but I have found it to lack accuracy, as regards the reading of its fourth and fifth glasses.

In 1888 Goldenberg [4] and in 1889 Jadassohn,[5] working independently, described a modification of the original irrigation test. Instead of irrigating the anterior urethra with a syringe, they suggested that a soft rubber catheter be inserted down to the bulb, and the urethra thus washed out. It is maintained by them that greater accuracy in irrigating is obtained when the catheter is em-

ployed. On the other hand, in view of the difficulty of knowing just when the eye of the catheter is in the bulb, this method is liable to error, besides being difficult of performance; in practice this modification has not been accepted as an improvement on the original. In 1894, however, Goldenberg[6] eliminated this possible source of error by substituting a short hard-rubber tube for the soft long catheter. This tube cannot reach beyond the bulb owing to its shortness, which is a decided advantage. On the other hand, its hardness is a distinct disadvantage, in that it is liable to act as a foreign body in an inflamed and sensitive urethra.

A somewhat similar tube is used by Young.[7] This tube is made of glass, rounded at its end by heating in a flame, and pro-

Fig. 3.



See Fig. 7, page 14.

vided with a cup (half a small ball) at a point about 10 cm. from its end. After being boiled, it is easily inserted as far as the bulb, and the reflux of the irrigating fluid is caught in the rubber shield, beneath which the glass receptacle is placed (Fig. 4).

Young has modified the Kollmann five-glass test by differentiating between the pendulous and bulbous portions of the anterior urethra.[7] I can best describe this test by quoting his own words:

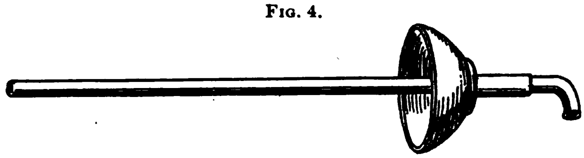
"The patient is instructed to compress the urethra between thumb and finger far back at the root of the penis (at the suspensory ligament); the irrigating tube is then slowly inserted, with the water running, up to the point of compression (suspensory ligament) and the fluid escaping is caught in two glasses, the first containing shreds, if any, and the second clear (showing thorough cleansing). Then the patient's fingers are removed, and the tube

carried back as far as the deeper part of the bulbous urethra, the urine again being caught in two glasses, the first containing shreds from the bulbous urethra and the second clear as before. The patient then voids his urine as in Kollmann's test.

"Besides being far simpler, owing to the use of the lavage tube and cup in place of a catheter, the differentiation of the pendulous and bulbous portions of the urethra afforded has proved not only of considerable interest but often of great importance in locating the lesion and directing the character and extent of the treatment."

It is readily apparent, in studying this description, and even more so when the test is applied in practice, that much of its success and whatever value it has depend upon the co-operation of the patient in holding his fingers at the right spot, and even this spot itself is not subject to exact location by the surgeon. If the patient's finger should move accidentally half an inch forward the test would be nullified, because a portion of the urethra anterior to the sup-

FIG. 4.



Young's Urethral Irrigation Tube.

posed point of compression, namely, the suspensory ligament, has not been reached by the irrigating fluid. In other words, the point of compression being at the mercy of the patient's fingers, and not accurately visible from without, this test loses a great deal of its theoretical value in actual practice. Nevertheless, the test is well worth using in some cases.

In order to be sure that none of the irrigating fluid has passed beyond the external sphincter, and thus vitiated the test, various chemical devices have been employed, with more or less success. Lohnstein first suggested that the anterior urethra be irrigated with a 5: 1000 solution of ferrocyanide of potassium. The patient then voids his urine into a glass, and a few drops of tincture of chloride of iron are added to the urine. If any of the irrigating fluid has passed the sphincter, into the deep urethra, a chemical reaction will take place with the ferrocyanide, and the Berlin blue reaction will be observed.

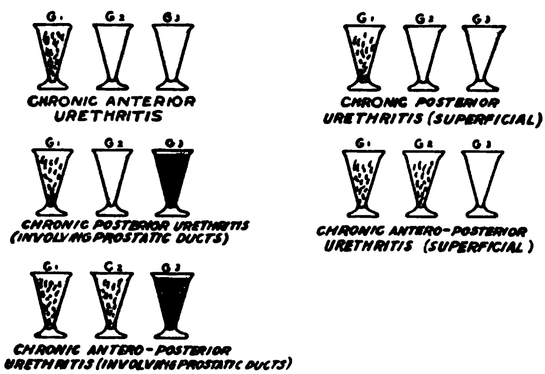
Another and more simple method (Kromeyer) is to irrigate the

anterior urethra with a 1: 1000 solution of methylene blue, and then have the patient void his urine. If any of the colored fluid has passed beyond the sphincter, the shreds and the urine itself will be stained with the solution used for the irrigation. Potassium permanganate solution may also be used. I find this method a very useful and practical one for routine practice; it can be employed in connection with any of the irrigation tests.

A marked advance in the positive diagnosis of posterior urethral conditions was made by Jadassohn in his "Expression Urine" test. Briefly, the patient voids his urine into two glasses. The prostate is then massaged vigorously, and the patient voids his remaining urine into a third glass. This glass will contain the secretion ob-

Fig. 5.

JADASSOHN EXPRESSION URINE TEST



See Fig. 7, page 14.

tained by massage of the prostate and seminal vesicles (Fig. 5). This test is extremely reliable and trustworthy, so far as the third glass is concerned, though its first and second glasses are open to the same criticism as the two-glass test. When used in conjunction with the simple irrigation test, however, Jadassohn's suggestion is a very useful one, in that it gives us information that cannot be obtained in any other way. I employ it regularly in practice, and have found it of the highest value. It should be used in chronic conditions exclusively, owing to the inherent danger of prostatic massage in the acute stage.

In conjunction with the irrigation test, we have the washings of the anterior urethra in the first glass, the clean washings in the second

or control glass, the urine voided by the patient, containing pus and shreds lying in the prostatic urethra, in the third glass, and the inflammatory elements forced out of the prostate and seminal vesicles by massage in the fourth glass. There can be no error in this test, if it is properly performed, and it can be done in a few moments.

Some writers have maintained that they have been able to obtain the secretion from the seminal vesicles and the prostate separately with the aid of this procedure, but this is extremely doubtful. At any rate, even though the technic employed may have made it possible to secure these separate secretions, there is no way of identifying the one from the other; and, moreover, in view of the simultaneous inflammation of the prostate and seminal vesicles, which is the rule and not the exception, it does not appear clear what advantage would be gained if such a separation could be effected.

Apropos of the test just mentioned, it is well to emphasize the importance of massaging the prostate and then examining the urine passed by the patient in every chronic case involving the deeper parts. The amount of interesting and useful information obtainable in this manner is sometimes indeed surprising. It is not at all unusual to encounter a case of chronic prostatitis in which the prostate seems normal on palpation per rectum, and nevertheless the urine contains "comma" shreds and the patient is troubled with clinical evidence of chronic prostatitis. The irrigating tests show nothing but the presence of "comma" shreds in the urine voided by the patient, which is at once corroborative of the suspicion that the trouble lies in or near the prostatic urethra. In addition, the urine, apart from the shreds, is absolutely clear.

On massaging the prostate in such a case we are often surprised to find a more or less copious flow of prostatic secretion at the urinary meatus; but when the patient voids his urine after the massage, into a clean glass, we find the urine quite hazy with prostatic elements, in addition to which we find innumerable floating masses or plugs, sometimes an inch or two in length and perhaps half an inch in circumference. These bodies sink to the bottom of the glass, but they can be examined by stirring the urine with a rod. Very often these plugs represent perfect casts of the prostatic ducts and follicles in which they have been embedded and from which they were forced by the massaging finger.

It is of the greatest importance to collect the prostato-vesicular

secretion which exudes from the urinary meatus during and after massage, upon a glass slide, and submit it to microscopic examination. Under the microscope, this secretion is often seen to contain gonococci, thus offering an explanation of many of those obscure cases of autoinfection or reinfection on the slighest sexual or alcoholic excitement. In this way a large proportion of our so-called incurable cases will be explained. In previous papers I have shown that it is not at all unusual to find gonococci innumerable in the massaged prostato-vesicular secretion in patients who have considered themselves well for a long time.[8]

Occasionally we encounter patients who cannot void urine after prostatic massage, and consequently the most important part of the test is lost. Occasionally such patients can be assisted in voiding the urine by the time-honored method of letting the water run from a spigot; but even this measure often fails, and the patient will only succeed when the physician leaves the room and busies himself elsewhere. If, however, all other means fail, it will be necessary to inject from four to six ounces of some warm bland fluid into the bladder, either with or without a catheter, preferably the latter. This will usually succeed, and the fluid then passed, mixed with whatever urine was in the bladder, can now be examined macroscopically and microscopically.

A careful review of the tests above described will show that they offer no way by which inflammatory products can be differentiated as to their origin, as between the posterior urethra and the bladder, with absolute accuracy and mechanical correctness. All of these tests assume that after the anterior urethra has been washed out the first urine passed carries with it the washings from the posterior urethra, the second urine represents the bladder urine, and the third represents the last bladder urine plus the inflammatory products squeezed out of the prostatic glands and ducts. As to the first glass, there can be no doubt; but it is not difficult to imagine that the so-called bladder urine may contain some of the posterior urethral products that have dropped back into the bladder, and consequently the bladder urine does not appear in the second glass uncontaminated. This is particularly true in cases in which there is a profuse secretion of pus in the posterior urethra. In such a case, a cloudy first glass is correctly taken to mean pus in the posterior urethra, and a cloudy second glass is incorrectly taken to mean pus emanat-

ing from the bladder. Likewise a cloudy third glass does not necessarily indicate that the prostatic glands and ducts have been squeezed and emptied their contents into the urethra. I admit that very often the third glass gives unmistakable evidence that the pus and shreds have come from the prostatic follicles, but there are too many exceptions to the rule to justify our acceptance of these readings without considerable reservation.

In 1906 I reported and described a test which I had been using for some time, and which, I have been quite convinced, enables us to differentiate with considerable accuracy between the inflammatory products emanating from the anterior urethra, posterior urethra, prostatic ducts and bladder.[9] The test was incorrectly designated at that time the "three-glass catheter test," but I have since then called it by its correct term, the "five-glass catheter test."

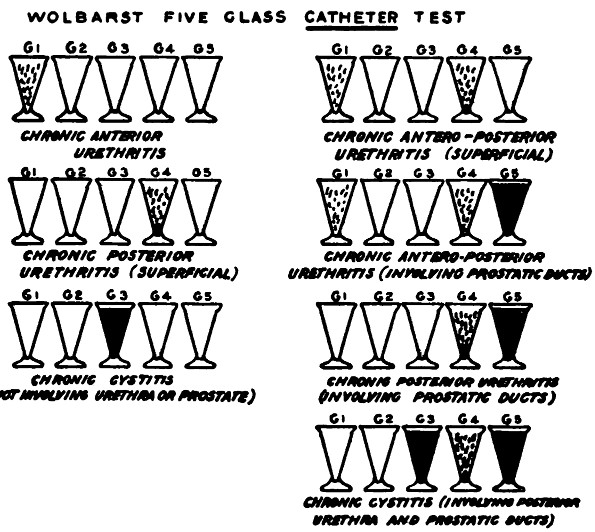
This test has been used freely in private and hospital practice, by myself and others, with considerable success. It has the combined advantages of simplicity, ease of performance, and accuracy.

Technic.—On the patient's first visit this test may be used, though it is often advisable to postpone the detailed test until the second visit; like most of those already mentioned, the test is best performed in the morning, before the patient has voided the urine collected during the night. The urinary meatus should be closely examined, and if there be any discharge it should be placed on a clean slide and, after proper staining, examined microscopically. For the irrigation of the anterior urethra, I prefer a small glass syringe holding about one ounce. The patient lies on an examining table, with a measuring glass (capacity up to sixteen ounces) lying snugly between the legs. From four to six ounces of irrigating fluid are usually sufficient to thoroughly empty the anterior urethra of its inflammatory products in the average case of chronic urethritis. The washings are gathered in the measuring glass and thence transferred to a glass which we designate as glass 1. A second washing determines the fact that the urethra is absolutely clean, so far as its anterior portion is concerned. These washings are poured into a second glass, which is the control. A sterile soft catheter of small calibre is now introduced into the bladder, and about one ounce of urine withdrawn into glass 3. This is the bladder urine. If this urine is clear and sparkling, we *know* that the bladder and the upper urinary tract are normal; the catheter is withdrawn and the patient

voids about an ounce of urine into glass 4. Now, if this urine has been voided over a normal prostatic urethra, this glass will contain clear urine; if, however, the posterior urethra contains pus or shreds, they *must* be found in this glass, inasmuch as the anterior urethra has been washed clean, and the bladder urine has been proven clear. It will thus be seen that this test gives us the washings of the anterior urethra, posterior urethra, and bladder in a most unmistakable manner (Fig. 6).

When, however, the urine drawn from the bladder through the catheter is not clear, but contains pus or shreds, we are unable to say

FIG. 6.

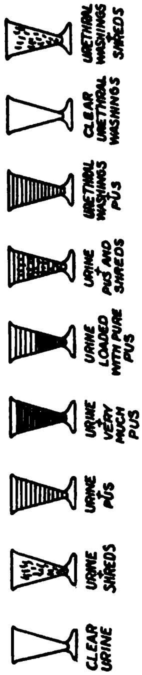


See Fig. 7, page 14.

whether these inflammatory products originate in the bladder or upper urinary tract, or have regurgitated backward into the bladder from the prostatic urethra. This question can be answered quite easily by this test. The catheter remaining *in situ,* the bladder urine is drawn off (glass 3), leaving the bladder empty. The viscus is now thoroughly irrigated through the catheter, until the washings come out clear. Then four to six ounces of warm sterile water or boric solution are injected into the bladder and the catheter withdrawn. The bladder now contains four to six ounces of clear fluid and all its inflammatory products have been removed. The patient voids into a glass (glass 4). If the water just passed into glass 4

is clear, we are certain that the prostatic urethra is not diseased, and the pus in glass 3 must have come from the bladder or kidneys; if, on the contrary, this water contains pus or shreds, we have posi-

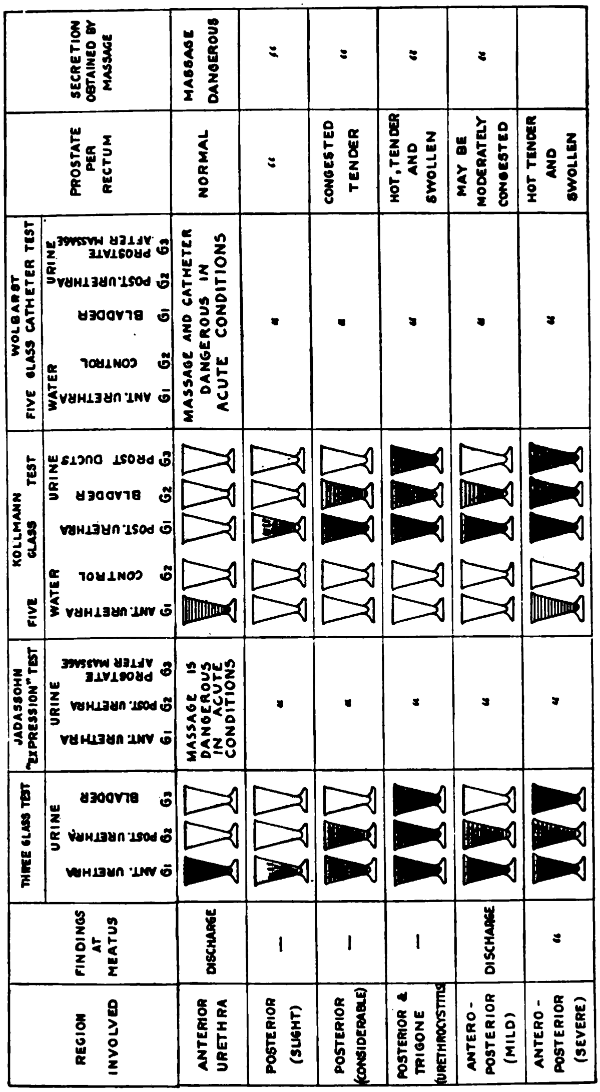
Fig. 7.



Explaining method of indicating contents of glasses shown in illustrations. Glasses representing urethral washings are not colored.

Fig. 8.

ACUTE URETHRITIS



Charts demonstrating the use of simple and irrigating tests in the diagnosis of lesions in urethra, prostate and bladder.

tive evidence that these inflammatory products have not come from the bladder nor from the anterior urethra; hence they must have come from the deep or posterior urethra.

Now, if it is desired to study the massaged prostato-vesicular secretion, the prostate and vesicles are vigorously massaged, as in Jadassohn's test, and the patient voids the balance of the bladder

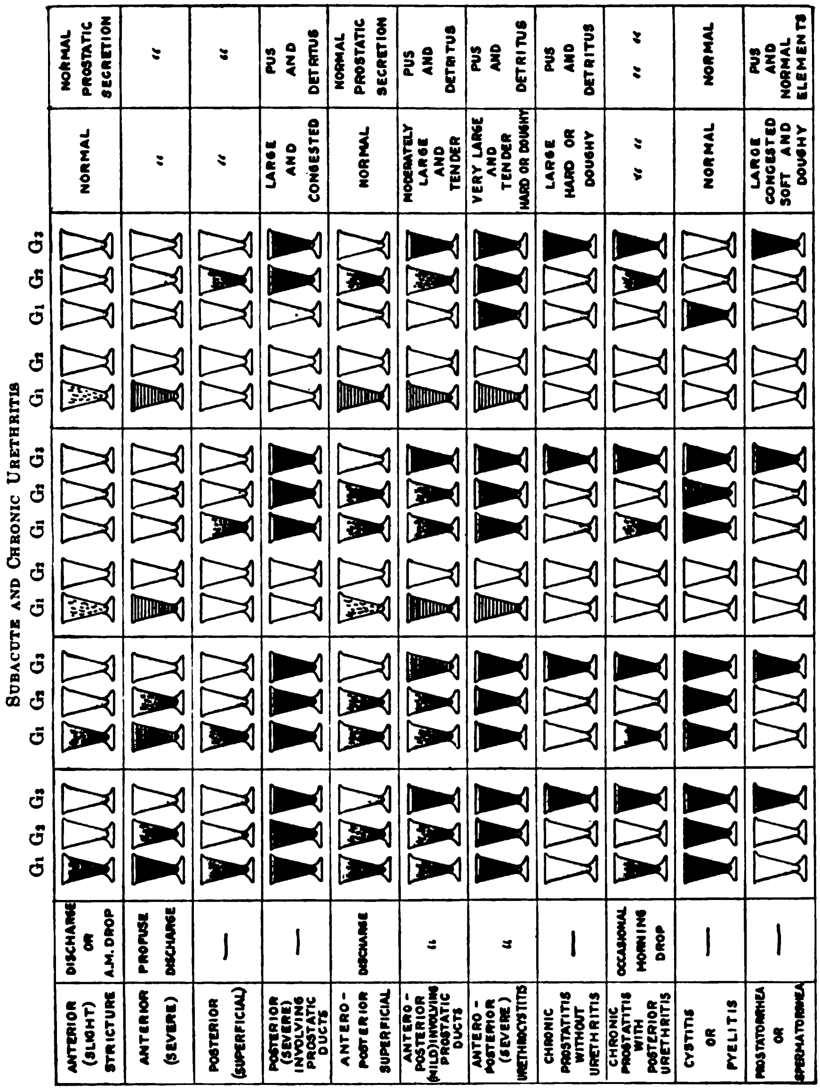


FIG. 9.

contents into still another glass (glass 5). This gives us accurate information concerning the prostate and seminal vesicles as revealed by massage. An examination of the patient is never complete un-

less this portion of the test is made, because a large proportion of chronic cases are dependent for their chronicity upon the presence of gonococci and allied bacteria in the prostatic ducts and follicles.

It goes without saying that the urethra should be examined for stricture at a subsequent visit, and in doubtful cases both the anterior and posterior urethra should be examined with the appropriate urethroscope. These matters need be merely mentioned at the present moment. In occasional instances cystoscopic examination is also required before the final diagnosis can be made. However, for every purpose in general practice, especially for the general practitioner, this test will be found sufficient.

For the purpose of explaining schematically the tests above mentioned, the table in Figs. 8 and 9 is presented, in the hope that it will be of some service. It is based somewhat on the chart prepared by Young in his description of his seven-glass test.[7] It will be noted that I have not made any attempt to differentiate between the pendulous and bulbous portions of the urethra, as I do not consider this differentiation of sufficient clinical or practical importance.

I am firmly convinced that the tests described in this paper constitute a most valuable method of differential diagnosis in lesions of the lower urinary tract; also, that a more widespread knowledge of their value and simplicity of technic will serve to bring about more satisfactory results in diseases of the genito-urinary tract. If, therefore, this humble contribution will serve to awaken a further interest in the subject its purpose will have been fulfilled and the writer will feel amply repaid for the effort.

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VENEREAL DISEASE IN THE UNITED STATES NAVY—ITS PREVENTION AND TREATMENT

BY SURGEON J. S. TAYLOR, U.S.N.

It is popularly supposed that doctors in the navy have little to do and that their labors are practically confined to venereal infections. This is not true, but from its serious and often lasting injury to the individual, its demoralizing effect physically, mentally, and morally on the personnel, because of the loss of time from active duty it entails, and by reason of its ready communicability to the innocent, venereal disease is a subject of vast practical importance to the navy, comprising, as it does, some fifty thousand male adults collected, not from the fishing villages of the Atlantic seaboard, but from every town, large city, and country district from Texas to Oregon. Of these, a large number sooner or later return to the pursuits of civil life, carrying with them whatever of good or bad they have acquired during their enlistment, while during that enlistment they are constantly coming ashore in our various ports and travelling hither and thither on leave.

In this day of extended civic activity, of increasing courage to face facts that bear on the general welfare, to attack problems once neglected because they trenched on unmentionable things, the prevention of venereal disease, if such a thing is possible, becomes at once a matter of paramount importance to every community, military or civilian.

Self-interest, patriotism, knowledge, love of one's kind, every instinct of progress, combine to demand from all enlightened citizens, and particularly from members of the medical profession, that the social evil and venereal disease be made the subject of deep study and fearless, unremitting attack.

The peculiar and distinctive conditions of military life afford to medical officers of the navy opportunities to study and control venereal disease in a way not yet open, and to a degree still impossi-

ble, for the civilian practitioner, who is hindered by social, moral, and ethical restraints of all kinds. He has to do only with patients, we are intimately associated with our *prospective* patients as well, and so have been the pioneers in the matter of prevention of venereal disease; but there are many ways by which the civilian may indoctrinate the public on the subject of preventive treatment, and it is decidedly to the interest of both army and navy that this propaganda ashore be begun and prosecuted with vigor, for we have more to fear from the civilian community ashore than it has from us.

Sailors usually frequent special resorts and have the same resorts and bring away more than they take in. The sirens and harpies who entice them and inoculate them are women of a special class, women who in the inevitably rapid descent in the scale of respectability, in the scale of market prices they command, in the scale of fashion and desirability, have gravitated to the sailor. They have usually received their first downward impulse and the first implantation of disease from civilians, not from the military.

I, therefore, solicit your earnest consideration of the discussion here following in order that by the dissemination ashore of knowledge about prevention and the gradual introduction of its use venereal disease may be further reduced in the service. There is this great difference in conditions that confront us. We of the army and navy have little difficulty in spreading information on the subject, but it is hard, either by compulsory methods or moral suasion, to establish the systematic use of prophylaxis, and its effective employment, too, is difficult for the enlisted man, because *promptness* is essential, and between the time of infection and the availability of the remedies considerable time must elapse, since our men go ashore at 1 P.M. or 4 P.M. with liberty till 7 or 8 A.M. of the following day, often for liberty of 24, 48, or 72 hours.

The civilian, on the other hand, has but a limited field for advance instruction. Still, by lectures to men only and by writing for the press something can be done to educate the public, and surely if every venereal paying patient were informed by his medical attendant of how to avoid a similar sad "accident" in the future, a few years could not fail to bring a noticeable reduction in venereal cases, for advice one pays for is usually followed, and the short hour's ride on trolley or subway that alone separates the worshipper

of Venus from the shrine and his lodgings renders prompt, and so efficient, prophylaxis perfectly practicable for the dweller ashore.

The following table shows approximately the extent to which venereal disease exists in the navy, or at least the number of confessed cases. How wide the discrepancy between tabulated cases and cases secretly treated afloat and ashore must be left to individual opinion. I believe it is considerable.

Tables Showing Prevalence of Certain Venereal Diseases in Navy and Marine Corps 1907–1910

1907

Total average strength Navy and Marine Corps	46,336
Total average strength Navy and Marine Corps from reports of the Medical Department	44,083
Total of admissions and readmissions for all diseases and injuries	32,627
Total of admissions for chancroid	545
Total of admissions for gonorrhœa	2,274
Total of admissions for syphilis	881

1908

Total average strength of Navy and Marine Corps	52,913
Total average strength of Navy and Marine Corps from reports of the Medical Department	50,984
Total admissions and readmissions for all diseases and injuries	36,982
Total admissions for chancroid	657
Total admissions for gonorrhœa	2,959
Total admissions for syphilis	802

1909

Total average strength of Navy and Marine Corps	57,172
Total average strength of Navy and Marine Corps from reports of the Medical Department	55,550
Total admissions and readmissions for all diseases and injuries	50,931
Total admissions for chancroid	1,562
Total admissions for gonorrhœa	5,764
Total admissions for syphilis	1,186

1910

Total average strength of Navy and Marine Corps	58,340
Total average strength of Navy and Marine Corps from reports of the Medical Department	56,721
Total admissions and readmissions for all diseases and injuries	48,795
Total admissions for chancroid	1,968
Total admissions for gonorrhœa	6,062
Total admissions for syphilis	1,150

When we come to enquire to what extent prophylaxis has reduced venereal disease, I must say frankly and with conviction that figures are not obtainable and, at best, could not be other than misleading.

Ten or twelve years from now the increasing use of prophylaxis must show a reduction in venereal disease. For the present, statistics, which, when not properly interpreted, usually give erroneous ideas, would suggest that venereal disease is increasing. This is because, with the systematic employment of prophylaxis, more attention has been paid than formerly to the discovery and tabulating of all cases. But I do not hesitate to say that to-day as a result of his own personal observation and experience with men afloat or ashore every naval surgeon will recognize the enormous value of prophylaxis, and it is mainly of my own observations during a period of eight years that I propose to write.

Venereal prophylaxis came to us from abroad, even as did the classic condemnation of it by Ricord, whose dictum as to how one may surely acquire gonorrhœa is familiar to every medical student. His anathemata against the preventive injection long had weight with me and still deter some from subscribing to prophylaxis, but *strong* injections after coitus, increasing the natural irritation incident to a night's debauch, have no place in the preventive system practised in the navy of the United States.

My first serious consideration of any measure other than general cleanliness and ablutions with sublimate or permanganate solutions dates from early in 1903, when some curious little samples were furnished certain officials in Washington by one of the foreign attachés there. They were passed around as not only curious, but "curios," these little collapsible tubes with nozzles suitable for introduction into the meatus and carefully labelled "before" and "after."

Recently I have learned from French naval surgeons that anointing the penis with lard or other unguent prior to going on liberty, an old practice in their service, is now superseded by the advance use of calomel ointment, but the notion of enforcing prophylaxis provoked their astonishment and condemnation. Germany is more active in the matter, requiring the employment of preventive measures, and punishment by arrest for one to three days overtakes the venereal patient who contracts the disease from failure to use

prophylaxis. While punishment is not part of their regulations and is still optional with the captain of a vessel, it is generally administered and the results are striking, if we may believe the statistics in print regarding the reduction of venereal disease in the German Imperial forces. From 1898 to 1908 a reduction of over 50 per cent. in venereal diseases is claimed for the navy, and I see no reason for not accepting the statement.

In 1905 I joined a battleship, a flagship, bound for the Far East. At our first port of call in China, the Admiral, having heard of my efforts to reduce venereal disease on the ship, authorized the medical officers to prepare, for distribution among the crew, printed leaflets resembling in paper, size, and type a "general order," but unsigned, which gave general advice on the subject, urged men to take preventive treatment and to report immediately to the doctor on the first symptoms of infection. This step did good. The quickest "cures" I ever effected were in young lads who, warned by my circular, came to see me as soon as they felt the first premonitory tickling.

But I was soon detached and went to Pekin, China, with three officers and one hundred and twenty-five men, as the guard to the United States Legation. There I began systematic instruction of the men by informal lectures, at which the commanding officer was present to lend weight to my counsels. In the hospital building a room was set apart for prophylaxis.

Here I provided a large wooden tub round which the men could stand to take their injections. Soap and water, a solution of silver nitrate (1–5000), hard-rubber tipped hand syringes, and a basin of disinfectant for the hands were provided.

During a period of twenty months' service with this company of one hundred and twenty-five marines there occurred but one failure of the preventive, and this was a doubtful case. The man claimed to have taken the treatment, but my hospital steward, who was thoroughly reliable and watched the conduct of affairs very closely, insisted that the man had never taken any preventive, and, at all events, there was no record of the fact in the book kept for the purpose. At that time in Pekin the German, Japanese, Austrian, French, and Italian Guards had each a house of prostitution of their own, inspected and regulated by their medical officers. From these

places our men were, of course, excluded, and all foreigners were rigorously excluded from Chinese brothels in the native city.

There was nothing to interest and amuse or distract the men in their barrack life at this remote post in a foreign country except what was done by the only lady there, an officer's wife, who, with the aid of her husband, got up a series of interesting monthly lectures for them and entertained the men with games and refreshments at fortnightly intervals in her own drawing-room. Right or wrong, the men did cohabit with prostitutes, and the only available ones were the few miserable creatures, the lowest and dirtiest of their class, who could find employment neither in the licensed military houses nor in the fashionable resorts of the Chinese city. They plied their trade, soliciting in the darkest alley of the legation quarter and chiefly in the unlit lane behind our barracks, under the shadow of the overhanging Tartar wall. We had a good deal of venereal disease. It was always less after my periodic discussions to the assembled company. Between times the men got careless, neglected preventive treatment, and acquired gonorrhœa. There was no compulsion, no punishment. Moral suasion only was permitted. It acted only while my burning words made burning urethras prominent in the minds of the listeners.

My stay in remote Pekin had put me out of touch with the naval service proper. Returning to America, I found that my favorable impressions of prophylaxis were shared by medical officers generally throughout the service who were using it widely.

Besides injections against gonorrhœa, calomel ointment inunctions against syphilis were in general use. Reports were coming in on all sides that testified to the efficacy of prophylaxis.

The Bureau of Medicine and Surgery now supplied printed circulars of information and advice. Already a large number of officers of both line and staff (other than medical), chiefly younger officers, were commending the efficacy of prophylaxis. Already some commanding officers were taking a stand on the subject and quietly exercised their authority to back up the efforts of their medical officers by punishing men who obstinately and persistently refused to profit by preventive treatment, justifying their action on the ground that for a man to run a risk of infection and not use all available precautions. was deliberately to jeopardize others and

defraud the government of services while disabled, which he was paid to render.

This favorable sentiment had grown up following the results obtained in the fleet on the Asiatic station, whose Admiral had done everything in his power to further the efforts of the doctors.

Captains, executive officers, and doctors had combined to enforce and render effective the new scheme. The results were little short of marvellous in diminishing venereal diseases in the fleet, and officers and men were generally convinced that prevention worked.

Full instruction of the crew was now being insisted upon, and ideas of continence and morality as well as cleanliness were to be inculcated. A clean ship was to be maintained, so that the crew might "obtain in their own persons the highest physical state of fitness for all the duties" which devolve upon them. The commanding officer was to "require a sufficient and proper space, as might be most convenient, in the sick quarters or elsewhere, for the administration of prophylactic treatment to such as might desire it."

Article 840, paragraph 2, of the regulations for the government of the navy prescribes that "liberty shall not be granted to men who have contagious diseases." For many years the practice has existed, under this regulation, of detaining aboard ship men suffering from gonorrhœa and chancroids, and syphilitics having open lesions in the mouth, etc. By this means, as no liquor is allowed the enlisted men on a ship, and its introduction on board is treated as a most serious offence, venereal patients are unable to get liquor—a very important consideration in treatment. Also the spread of disease is checked, for a ship's crew patronizes, as a rule, the same resorts when on leave, and venereals going ashore would communicate their ailments to women, by whom their own shipmates would in turn be infected. In these respects the practice of restriction is admirable. Every venereal case coming to the doctor's notice is reported to the "ship's writer" or clerk, and his name is stricken by that functionary from the liberty lists until such time as the doctor directs the removal of the restriction.

Unfortunately, a large number of men, to avoid the unpleasant deprivation of liberty, do not go to the doctor for treatment, preferring to seek advice from one another or to suborn, if possible, one

of the hospital corps to furnish them such remedies as he daily hears the medical officers prescribe, or, better still, preferring to keep their ailments secret, go ashore for treatment from civilian physicians; and, alas! the healers they often select when in trouble are not the best men in the profession, but the worst—men who really have no place in it, quacks, charlatans, human vultures, preying upon the unfortunate bluejacket and growing fat on his misfortune, his prejudice, and his ignorance. Men also conceal their condition when they contract venereal disease from failure to use preventive measures for fear of punishment. Herein lies the crux of the whole situation.

The statistics obtained where prophylaxis is in vogue are thus vitiated and rendered deceptive. This concealment becomes evident when some complication such as a bubo or an epididymitis renders them unable to perform their duties and the only way to be excused is by being put upon the sick list by the doctor, to whom their condition then becomes patent. When, therefore, I began my cruise I got the captain's authority to announce that any man who contracted venereal disease after the proper and diligent use of preventive measures would not be restricted to the ship. This acted with many as an incentive to patronize our treatment, but immediately led to an abuse which demanded still further measures. It soon got to be quite common for men with gonorrhœa to wait until the period of greatest acuteness had subsided and then some fine morning, after washing up and voiding urine, to present themselves for preventive treatment, get their names in the record book, and a day or two later report at the sick bay, admitting gonorrhœa and accusing the prophylactic system of being worthless. Everything then depended upon the knowledge and incorruptibility of the nurse who served out the treatment, who was instructed to examine each applicant carefully before permitting him to take a prophylactic injection.

When I was transferred to another vessel I succeeded in interesting my new commanding officer in the subject of "prevention" to the extent of taking active measures to educate our crew of over seven hundred men on these lines, and my assistant and I lectured daily to groups of twenty men at a time until every soul on board knew what we aimed to do and why and had been reminded of the

serious nature of the maladies in question, etc., etc. Following these lectures, more leaflets were distributed and notices calculated to point a moral and show the value of the system were posted on the various bulletins of the ship. During the two months required for the wholesale instruction of the crew copies of the following notice were handed to all men as they went over the side for leave:

READ CAREFULLY

Gonorrhœa, Chancroids, Buboes, Syphilis are spoken of as Venereal Diseases. They cause more sick days, more pain, suffering, and permanent ill health than any other sickness, accident, or injury in the service.

It is the earnest desire of the Medical Officers of this ship to reduce as far as possible the venereal disease on board. The first step in this direction is to impress on every one the fact that venereal diseases are not trifling and unimportant and to be regarded as a joke, but the source in many cases of lasting misery not only to the original victim but to other and innocent people.

Treatment of those afflicted with venereal disease should begin with the first symptom. The moment, therefore, that you notice anything wrong, come at once to the sick bay and consult the doctor. Every day's delay at the beginning means weeks and months' delay in getting well.

The so-called PREVENTIVE TREATMENT has been used for a number of years both ashore and afloat in the United States Navy and in foreign military services, as well as by civilians, with good result.

When used *as directed* it is at least harmless. It will not prevent the return (under provocation) of an old uncured attack.

PREVENTIVE TREATMENT consists of thorough cleansing of the privates, the use of a mild injection, and of rubbing in an ointment for several successive days.

The treatment must be employed within six or eight hours after running the risk of infection. Up to that time the germs lie near the surface and can be easily reached by antiseptics. The fluid is injected to just fill the penis, but must not be forced into the bladder. It must be retained for at LEAST TEN MINUTES.

Immediately after return from liberty report at the head, where a hospital apprentice will be stationed from 7.45 A.M. to 8.30 A.M. to give out treatment.

Those going on 24-hour liberty will, on request at the sick bay, be furnished with a prescription by which they can procure the necessary articles at any drug-store at their own expense and so employ the PREVENTIVE ashore the moment it is needed.

You are reminded that drinking while on shore greatly adds to the danger of catching venereal disease, and when so contracted it is apt to be a more serious and lasting affair.

J. S. TAYLOR,
Surgeon, U. S. Navy.

Things went on in this way until the spring of 1910, when the Commander-in-Chief came boldly to the rescue and gave official recognition to venereal prophylaxis.

When one remembers how readily the press itself, or, through it, not only well-meaning and thoughtful persons holding other views, but irresponsible and ignorant individuals, assail the motives and actions of those standing high both in military and civil life, when one stops to consider how many are the aspects, both ethical and moral, under which this project presents itself, the Admiral's courage must at once be admitted.

The practice of "checking in" now became more or less general in the fleet. By "checking in" is meant that every man returning from liberty is required to report at the sick bay or dispensary, or whatever compartment is designated for the purpose, and state whether or not he has incurred the risk of contagion. Those who say "yes" are given preventive treatment, those who say "no" are dismissed. A careful record is kept of the persons so reporting and their replies, which serves as a basis for later action.

The "checking in" system seems to be the most applicable method of enforcing prophylaxis, but the objections to it are real and practical. The "checking in," while putting a good deal of pressure on a man, does not prevent him from concealing his condition later if he is willing to follow one deception by another. The remedy for this practice of concealment lies in periodic examinations of the crew or of such men as have been on liberty, for concealed diseases, as authorized by a special article in the regulations for the navy of the United States.

Of course, there is an answer to the objections and drawbacks attending the system. The great prevalence of venereal disease in the navy is a matter of serious import. It is responsible for an incalculable amount of suffering and disability, both temporary and permanent, to the individual. This needs no reiteration or elaboration here. Furthermore, it entails an enormous loss to the Government. Men so afflicted continue to receive their food and lodging and pay, regardless of the number of days that they are excused from work. When such men are invalided from the service, the time and money and labor expended in their training and education has been almost wholly thrown away. Again, when venereal disease is so prevalent in the service and the cases are concealed, the visit of a ship, a squadron, or a fleet to a given locality may become to it a serious menace.

Finally, the magnitude of the evil, both in military and civil life, to-day demands heroic and stringent measures for its abatement in the interests of our national development and progress, both physical and moral. Sentimental considerations must give way to practical ones in the face of the appalling results to guilty and innocent alike. Nor is the "checking in" system wholly out of harmony with affairs aboard ship. There is no detail of food or clothing, of personal hygiene and health, which is not planned, regulated, and controlled for the enlisted man by those in authority. Every movement, every act, the hour for rising, for turning in at night, for swimming, for exercise, for recreation, for work, is ordered for him; vaccination is compulsory, personal cleanliness is compulsory; the periodic scrubbing of bags and hammocks, the airing of his bedding, the washing of his clothes, the sports he indulges in are prescribed. Why should a parental system stop short at so critical and vital a concern as the one in question?

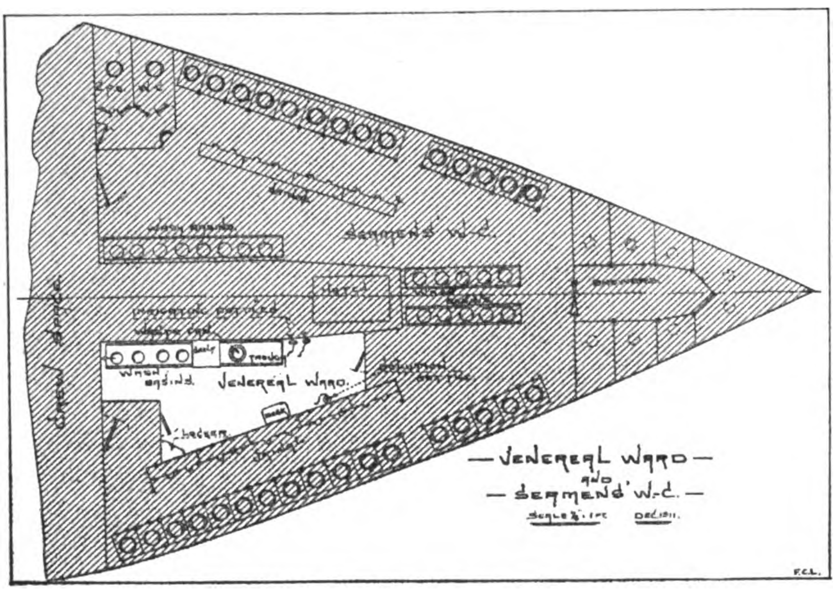
Righteous, virtuous, short-sighted inculcators of morality have long objected that to teach preventive measures against venereal disease is to teach immorality by ridding it of its chief terrors. I would reply to this that the stress laid on the importance of prevention is stress laid on the horrors of venereal disease, and I firmly believe, from what I have seen and heard during my thirteen years in the navy, that the terrible nature of venereal disease is better appreciated and its consequences more dreaded to-day since the agitation for prophylaxis than ever before, and that all the fuss being made on the subject deters from loose living far more than the possible immunity from its consequences incites to immorality. Nor can I believe that any right-minded, sensible young man, of good principle, will ever be encouraged to indulge in venery because he sees the elaborate, systematic, and persistent efforts to check the influences of venereal disease.

I have gone into the ethical side of this subject at some length with a very definite purpose in view. The medical officers of the navy have at last attacked this curse—venereal disease—with all their might and all their energy. Infinite pains, infinite patience, infinite tact, infinite determination are represented by what has been accomplished, but the problems incident to the campaign are not yet solved, nor have results satisfactory to us been obtained.

Much remains to be accomplished, and before success is attained the strong, united backing of the entire medical talent of this country may be sorely needed. Therefore, an intelligent interest and sympathy upon the part of our colleagues in civil life are indispensable.

Venereal disease, to be successfully reduced to a minimum in the service, must be attacked in a distinctly uniform and methodical way throughout the entire service. A complete system of procedure must be inaugurated and enforced by specific regulations, leaving nothing to the fancy or whims of the individuals whose understanding of the situation is limited by prejudice or ignorance. Instruction bearing on the moral as well as the physical aspect of the subject should be given to all the men, and, preferably, while they are recruits. The "checking in" system should be compulsory and reinforced by periodic examinations for concealed diseases. Every ship having a complement of one hundred and fifty men or more should be provided with a small compartment for the exclusive purpose of administering preventive treatment, inconspicuously but effectually. Such compartments have been installed in most of our

Fig. 1.



Gun deck of a battleship (bow).

larger ships, but in many cases as the result of the individual representations and efforts of the doctors on them. On my last ship I was granted nearly one-third of the crew's "head" (lavatory and water closet). I had it partitioned off, provided with doors of entrance and exit, with lockers, basins, table, etc., for private administration of preventive and also for the treatment of developed cases of venereal disease.

From the beginning it has seemed most wise to entrust the entire conduct of the "checking in" and prophylaxis to a competent member of the Hospital Corps, the medical officer not appearing actively in the business, so as to save as far as possible the *amour propre* of the men. It is equally important that any punishment administered in this connection should be unvarying and uniform. At present there is no uniformity. One commanding officer reprimands the offender, another imposes a fine through the medium of the deck court, another still imposes confinement and reduced rations.

While for a long time I have been opposed to imprisonment as a routine punishment, yet I believe that there will always be a need for a brig or cell on board ship. For most offences a fine and additional work, rather than inactivity in a cell, should be the punishment, but for these patients such confinement is almost ideal. Except in severe cases, venereal patients are not excused from duty, but undoubtedly this discontinuance of work and keeping quiet on a bread-and-water diet would contribute to recovery. The number of days of confinement and the rations allowed to an offender in the matter of *preventive* should be the same throughout the navy. I should suggest a week's confinement on diminished rations as an appropriate punishment.

There should also be a fixed punishment for concealing communicable diseases. When a syphilitic with open lesions on mouth or lips conceals his condition he should be tried by a court-martial, and the sentence should include the strictest deprivation of liberty until such lesions are healed.

There remains one more suggestion, which may seem at first blush to bear rather remotely on the question in hand, but prevention, if it is to be real and far-reaching, must include a study of underlying conditions. Every navy yard where our ships lie up for considerable periods should be surrounded by high walls which

cannot easily be scaled, and the crews of the ships should be allowed to come and go from ship to yard with perfect freedom when not required for work on board. Every yard should be provided with a gymnasium, billiard room, cinder track, playground, and a room for indoor games under the supervision of petty officers detailed in rotation from the visiting ships. A great many men, when a ship is lying at a navy yard, obtain liberty and go to town, there to become victims of its seductions and temptations, not because they really care to go to town, but because they wish to have a change from the ship and its endless routine. Often they have little or nothing to do in town that is either interesting or profitable, and very soon after pay-day they have little or no money to spend, but when repairs are going on, when everything is torn up on board and when the narrow alleys and close compartments which make their home ordinarily are crowded with yard workmen, the life on board becomes more than tedious—almost unbearable. A considerable proportion of the crew would be satisfied with a run in the yard and would return to the ship rested and refreshed and the better for their brief absence, instead of worse off, as is, alas! so often the case now.

To those who are opposed to prophylaxis as encouraging vice and putting a premium on venery let this appeal strike home. If we are not to combat the inevitable consequences of the conflict between weak masculine human nature, on the one hand, and, on the other, the glamour and charm of brilliantly-lit bars and seductive whisperings and enticements of painted women, then we should furnish counter attractions. In promoting this scheme for navy-yard improvement you civilian readers can do vastly more than we of the service, who are forbidden to solicit or influence legislation and often are powerless to move the authorities over us to initial endeavors.

So much for the need, the righteousness, the administration of prophylaxis in the navy. Of what does it consist?

Preventive treatment of gonorrhœa is based on the well-grounded belief that for a brief period after the gonococci have entered the urethra they are superficially located on the first inch of mucous membrane behind the meatus and can be destroyed by sufficiently prolonged contact with a suitable antiseptic.

It is not positively known how long this superficial location continues, but certainly, judging by clinical results, fifteen hours mark its extreme limit, and I am in the habit of cautioning those who use preventive treatment that they must not place too much confidence in it unless employed within eight hours, though up to twelve hours after intercourse it is still well worth a trial. Properly used immediately after sexual congress or within a couple of hours, I regard it as absolutely certain.

Recently I had a patient develop gonorrhœa, who, on return from liberty, used the preventive faithfully and, like myself, was disgusted at its failure. Careful questioning developed the fact that he had gone ashore at 2 P.M. and been exposed to infection about 5 P.M. of the same afternoon. He returned to the ship at 8 A.M. the next day and immediately took the prescribed injection —fifteen hours after infection. I have a record of one thousand six hundred and fifty preventive injections, covering a period of sixteen months, with three failures, or four failures, if the abovementioned case be included, which would represent approximately eighteen failures in ten thousand injections.

To be perfectly fair in considering the value of these figures, it must be remembered that doubtless many of the men who took preventive measures had cohabited with women who were not infected and would have escaped disease themselves even if they had not taken the injections. On the other hand, it may be questioned whether those who contracted the disease after using preventive measures had really employed them with the care and patience necessary. It is highly probable, too, that the injection was often taken after more than eight or ten hours had elapsed since the risk of infection.

The antiseptic most generally used as a preventive in gonorrhœa is a solution of some silver salt. Both in the American and German Navy argyrol and protargol are popular. Argyrol is used as a freshly prepared aqueous solution of 10 per cent. to 20 per cent. strength. Protargol need not be more than .1 per cent. strength, though some surgeons use it as strong as 2 per cent. or 3 per cent. Argyrol is unirritating, but its cost would make its use prohibitive for wholesale employment for the navy. Protargol, less expensive, has the disadvantage even in weak solutions of being rather irritating. I am opposed to its use as a preventive in the navy—for the present,

at any rate. We are trying to popularize a certain proceeding and to create a belief in it which will lead eventually to its regular and voluntary employment. It will be too much to expect at the outset any very general use of a remedy which causes real discomfort. I discontinued its use when I found out that a number of the younger men had fainted after using protargol and that there was fast growing up a very reasonable prejudice against the treatment. Of course, the smarting of the protargol was but the last straw, a case of *post hoc ergo propter hoc.* A sleepless night, tobacco, liquor, venery in excess were the real cause of the syncope, but the protargol got the full credit for it.

In any case, given the natural indisposition to go to the venereal ward, the feelings of regret, shame, disgust, the physical reaction and weariness that follow a night of excess, the natural prejudice against anything which is being urged upon him by his superiors, it would be too much to expect that a man would go cheerfully and eagerly to ask for an injection which was decidedly irritating. I have gone back to my original favorite treatment, a weak solution of silver nitrate of a strength of one to three thousand or one to five thousand, though I am informed by a German naval surgeon that a 2 per cent. silver nitrate solution is prescribed by himself and many of his colleagues, who admit its painful effects even when just instilled into the fossa navicularis. The weak solution is taken as an injection, filling the urethra up to the "cut off," and retained for five minutes. The liquid is allowed to run out and a second injection is taken and retained for five minutes. The object of the first injection is mainly to wash out the penis and remove all traces of urine, the chlorides of which might decompose the silver and make it inert. This weak solution causes only the most trifling discomfort at the first urination following. Were I in private practice, however, I should order argyrol 10 per cent., as the color of the solution and its costliness would have a mental effect not to be despised.

A good deal of time and thought has been expended on the problem of making prophylactic treatment available for men who are away from the ship for extended periods. On some of the ships collapsible tubes of antiseptic fluid and of calomel ointment were put on sale in the ship's canteen or could be obtained at the sick bay for a nominal price. A very few took advantage of this oppor-

tunity. On my last ship, printed prescriptions calling for the necessary articles were to be had on request at the sick bay. They were very seldom asked for. It would seem to imply that a certain proportion of the men go ashore without any deliberate plans for sexual gratification, or else the failure to arm himself with the necessary preventive is due to the happy-go-lucky traits of the sailorman. On another cruise I shall arrange to supply those desiring it with a prescription printed on some sort of glazed or enamelled card of small dimensions and of sufficient thickness to give it durability, so that a man may carry it on his person and present it to be filled again and again.

The prophylactic treatment of syphilis and chancroids consists in the use, after washing with soap and water, of a wash of corrosive sublimate, followed by calomel or calomel and carbolic acid in the form of an ointment with lanoline or lanoline and vaseline or lanoline and lard as a base. The strength of the ointment is 30 per cent. If the corrosive sublimate could be made to penetrate the tissues it would undoubtedly act as a destroyer of the *Treponema pallidum* and the ordinary bacteria causing minor ulcerations, but the greasy, fatty nature of the parts renders this penetration extremely uncertain.

Neisser recommends the use of the following solution:

Bichloride of mercury	2 grammes
Ether, alcohol, distilled water, each...................	333 grammes

The application of the ointment should be made in the most thorough manner. Every part of the penis and scrotum should be thoroughly anointed for five minutes three or four times during the twenty-four hours after intercourse. The following statement comes to me by letter from a medical officer of the German Navy: "The sublimate wash is very effective and, covering the penis before coitus with grease, especially the salve of calomel, is in high repute. But I think all these measures are insufficient to prevent syphilis. The spirochætæ are able by their great motility to penetrate very quickly into small lesions of the epithelium of the skin, and the abundance of fat in the skin prevents the sublimate solution from gaining access to the tissues to a sufficient depth."

I heartily subscribe to the above. Undoubtedly, if properly used,

these measures are of service, but they demand more time and trouble than the average sailor is willing to devote to them. Apparently other medical officers of the navy hold different opinions from mine in this matter, for not a few of them have told me that they consider the prophylactic treatment to be more satisfactory for syphilis and chancroids than for gonorrhœa.

In so far as treatment of venereal disease is concerned, I can only say that it is the routine treatment of physicians everywhere, modified by the advantages and disadvantages of service conditions. Among the disadvantages I would mention first and foremost the apathy of the men about their condition when the acute and painful stage is past. I regret to say that there still linger in the service some crude and erroneous ideas about gonorrhœa. Not a few younger men entering the navy are led to think by the older men that a "dose of clap" is needed to make them full-fledged sailors! These same false friends are the very ones who hold most strongly to the charlatan and the quack when in need of medical assistance. Though the doctor sustains to the crew a peculiar and distinct relation, still, the stigma of being an officer rests upon him. No matter how kind, just, and reasonable officers may be, the independent, free-born American citizens, embryo presidents, and possible millionaires who constitute the crew entertain towards them certain undefined but real feelings of hostility like those of a pupil for his teacher. The fact that medical service is free cheapens it here as it does everywhere. Could I disguise myself in a linen duster, a battered old silk hat, and a flowing beard, come aboard ship unperceived and set up shop in some ammunition passage far below decks and peddle my preventive treatment as a secret nostrum, the bottles wrapped in vividly worded circulars, they would go like hot cakes and bring a fancy price. Happily the knowledge of "606" has come to the public through lay sources, and men suffering from syphilis on our ships have shown great avidity to take it, in part, perhaps, because at the beginning it was credited with being a "cure." For the present, salvarsan has only been issued by the government for use in hospitals, but the men are more than willing to pay for it, and its employment aboard ship has been general from the first.

The prejudice against mercury is widespread, but I have usually

found that a quiet talk in the privacy of my room and a manifestation of real and personal interest in a case will lead a man to receive the treatment prescribed for him. I have a decided preference, based on results obtained in seventeen years of practice, for the inunction of mercurial ointment in the early secondary period. With a special compartment for venereal treatment the inunctions can be taken with thoroughness and without observation even on a man-of-war, where the lack of privacy in all the details of life is so absolute. It is often possible to get two syphilitics who know each other already, to rub each other, preferably in the lumbar region.

We usually have a certain day in the week when all syphilitics are required to report for observation, and likewise a day for other venereal cases. On some ships all syphilitics eat together at a special table. This measure is extremely popular with the rest of the crew, but not at all agreeable to the syphilitics themselves. On other ships the master-at-arms is furnished with a list of the luetics and sees that they wash their own mess gear.

Before the elaboration of Ehrlich's arsenic preparation I used the injection into the buttock of half-grain doses of bichloride of mercury in solution as a routine method of getting a patient with bad lesions promptly under the influence of mercury. It is far superior to the salicylate or succinimide. Of course, every antiseptic precaution was taken with these injections, and I have never had an abscess follow them and very rarely any considerable discomfort. It is unquestionably a close second to "606" in value, and I cannot speak too enthusiastically of its action.

The nurse in charge of the venereal ward is present on the day when cases of gonorrhœa report for observation. On that day they report to him first as soon as they turn out of their hammocks in the morning. This gives him a chance to determine the amount of urethral discharge and secure samples of the first urine passed, which he labels and brings with him to sick call. Men with gonorrhœa, except in very acute cases or when complicated by bubo, swollen testicle, balanitis, etc., are not excused from duty.

Injections or irrigations are generally used in the navy, the nature of the solution varying with the individual. Even as the doctors in civil life, we still have to comfort ourselves with Ricord's famous story of his own lack of success in the treatment of this

rebellious disease. When feverish or under the weather he always dreamed that he was in purgatory and that thousands of lost souls pointed the finger of scorn at him, saying, reproachfully: "Ricord, you could not cure my gleet."

I have a growing belief in the value of very weak injections retained for a long time—silver nitrate 1 to 5000, or permanganate of potassium same strength, as hot as can be borne.

When there is much local discomfort, prolonged injections of very hot water do good by equalizing the circulation, relieving congestion, and stimulating the tissues. If the disease is really a self-limited one, as we have been taught, and if the specific cause is really buried beneath the mucous membrane, hot water alone probably does as much good as medicated water. As the symptoms abate, the strength of the silver solutions is increased to obtain a rasping or harrow-like effect, and they are made to alternate with milder cleansing solutions. Chronic cases receive the usual treatment of deep instillations of silver, bladder irrigations, cold sounds, prostatic massage, etc. Even with the straight-tube urethroscope and illumination from a head mirror, ulcerations of the pendulous urethra may be located and treated by applications of minute crystals of silver nitrate fused on the end of a long probe.

I heartily agree with the late Robert Taylor, of New York, that for all genito-urinary work silver nitrate far exceeds the new and more fashionable preparations. The silver stick has no place in this field. Lunar caustic is not powerful enough to be a real destroyer of tissue. Nitric acid or the thermocautery should be employed. When a chancroid is flabby and foul I have the penis thoroughly soaked once or twice for the first day or two in a very hot saturated solution of copper sulphate. This treatment is not as severe as might be supposed, and the striking results usually reconcile the patient to its employment. This is followed by a light application of some dusting powder, preferably a soluble one, so as not to form a cake over the ulcer.

Iodoform has been largely given up on our ships owing to its odor, which readily becomes permanent in our small, artificially ventilated compartments. Mixed into a paste, however, with balsam of Peru, it loses much of its offensiveness, and I know of no better application for sluggish granulations than this combination.

Aristol as a dusting powder on the broken skin has the drawback

that it forms a crust, retaining secretions beneath it, deceiving and disappointing both patient and physician as to the progress of the case.

For years I have tried every method that appeared in print for aborting a bubo and have become convinced that it lies in the prompt and radical treatment of the chancroid itself. Once infection has taken place, it remains only to put the patient to bed with the flexed thigh supported by a pillow and await developments. At the first indication that the battle is going in favor of the poison, the patient is etherized and the entire gland removed through a free incision. While many cases operated on before suppuration has started may be brought to a speedy conclusion by suturing the wound, I prefer to leave it open to granulate from the bottom. I do the dressing myself for the first ten days or two weeks. Nurses can rarely be taught that packing a wound is not to be done with the zeal of a woman crowding a great many clothes into a very small trunk. As they regard buboes as sure to get well anyhow, they do not take the pains to avoid infolding of the skin, to insure real growth from the bottom, etc., etc.

A carelessly treated bubo usually ends in a troublesome sinus which has to be laid open two or three times, to the disgust of doctor and patient alike. A long initial incision, thorough cleaning out of every particle of glandular tissue down to the muscular plane, and light but careful packing of the whole wound are essential for prompt recovery. When, about the tenth day, pain and tenderness have disappeared and the surfaces are clean and healthy, it is of advantage to have the patient up and about the ward. I believe the majority of the younger men in the service prefer to sew up the wound after removal of inguinal glands in the hope of primary union. This desirable result is so often obtained that the attempt in all cases would seem justified were it not for the fact that when it fails the ultimate healing is far slower than when the wound was left open. Suppurating stitch holes, partial adhesions, bridges of ununited tissue all make for pockets and sinuses slow to heal. I therefore do not put in a single stitch if the skin edges are discolored or infiltrated or if a single drop of pus has been found in any gland.

In conclusion, it would seem proper to make some categorical

statement as to the actual results obtained in the navy by preventive treatment. As we have said before, it is not possible as yet to prove our contention by figures. The testimony of the medical officers of the service, over three hundred in number, is practically unanimous in favor of the system. The history of the employment of prophylaxis on the Asiatic station, if it could be given in detail, would afford a convincing argument for prophylaxis. We might contrast, for example, the case of four ships cruising together on which prophylaxis was not employed, which arrived on the Asiatic station with an average of twenty-five per cent. of their crews infected with venereal disease, with the case of a single ship on which preventive was used systematically for a long period. This latter ship returned to America by the Indian Ocean and the Suez Canal, and in spite of the well-known dangers, from the point of view of venereal disease, incident to such a route, five hundred confessed exposures to contagion in ports like Port Said and Naples yielded not one case of infection contracted. Such contrasts and illustrations could be recited without number. Suffice it to say that it is on such facts that our convictions are based.

On the ship to which I was recently attached I obtained the following data, which I know to be absolutely reliable, but they still leave us under the necessity of estimating and guessing what interpretation can logically be put upon them. During the period from July 1, 1910, to October 31, 1911, there were

35,917 liberties granted;
1,650 preventive treatments taken;
165 cases of venereal disease among a crew of more than 700;
5 cases of venereal disease developed in the 1,650 men who took preventive;
160 cases of venereal disease among the 34,267 men who did not take the preventive.

This does not make a very brilliant showing for preventive treatment—.3 per cent. infections after prevention, .46 per cent. infections for those who did not take preventive. The error is easy to find. For every case of venereal disease that shows in the table of medical statistics there are, at a conservative estimate, three cases that the doctor never hears anything about. As venereal cases, when known, are restricted to the ship, and as those who do not get preventive are liable to punishment, it can hardly be expected that any

large proportion of venereals will voluntarily come forward and put their heads in the noose when the ships are calling at ports like New York, Boston, or Philadelphia. On the other hand, when a long sea voyage is begun or the fleet goes to Guantanamo for the winter, the attendance at our venereal clinics becomes suddenly large.

Again, it is not to be supposed that every one of the 34,267 liberty men who did not take preventive incurred the risk of contagion.

It is a very conservative estimate that on an average 50 per cent. of the crew are exposed to the risk of contagion when on liberty ashore. (Directly after pay-day in a popular port the figure would reach 90 per cent., but when money is scarce and the neighborhood uninviting it is proportionately small.) Allowing, then, that half the liberty party on the ship in question ran the risk of contagion ashore, and that there were three cases of venereal disease not reported for every one which came to the doctor's notice, we get by simple proportion over 3 per cent. of infections in those not using the preventive, as against .3 per cent. of infections among those using the preventive. This estimate is regarded as even too conservative by most of the officers and men of the navy in a position to know the facts with whom I have discussed the topic.

Some of our medical officers have become discouraged and sceptical as to the possibility, under present conditions, of greatly reducing the curse of venereal disease in the navy, owing to the problems and difficulties, as outlined in this paper, that attend its employment. But there is a vast difference between the practicability of instituting a system of prevention among a large body of men and its actual value, if it could be so established.

To such individuals as will accurately follow the practice of prevention the most positive and gratifying results may safely be promised.

THE TREATMENT OF FACIAL PARALYSIS, WITH SPECIAL REGARD TO NERVE FRICTION

BY EDGAR F. CYRIAX, M.D. (Edin.)

LONDON

FACIAL paralysis may be supranuclear, due to lesions in the cortex; nuclear, due to lesions of the actual nucleus; or infranuclear, from involvement of the nerve in its tortuous course within the pons, or through the wall of the skull, or just at its exit.

Now, the routine treatment of such cases by means of electricity in its various forms, supplemented by massage of the facial muscles, and in some cases combined with the administration of nerve tonics (*e.g.*, strychnine, etc.), is the one almost universally adopted by the medical profession. Nevertheless, there exists another form of treatment, *i.e.*, that of "nerve friction"[1] according to the method of Henrik Kellgren, which, in combination with certain other manipulations, is a most valuable therapeutic agent, sufficiently so to justify me in bringing it into prominent notice. All the more do I wish to give my experiences in view of the fact that although this method has been in existence for over forty years, and has been employed by those who practised it continually during the whole of this period, it appears to be almost unknown to the profession at large. On the other hand, however, it must be admitted that this is largely due to the meagreness of the literature on the subject; indeed, the only descriptions of nerve friction which aim at detailed information that have appeared in print are those by A. Kellgren[2] and the author.[3]

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[1] Care must be taken not to confuse this name with that form of rubbing or massage of the skin also called "friction," but which is quite distinct from it.

[2] Stat. San.-Ber. d. K. K. Kriegsmarine für 1888, pp. 141–185, and "Technic of Ling's System," 1890.

[3] "Elements of Kellgren's Manual Treatment," 1903, and Cyriax and Kellgren-Cyriax, *New York Med. Journ.*, 1910, 171.

P. H. Ling (1776–1839), the founder of the Swedish system of gymnastics called after him, was aware of the facts that a slight pressure on a nerve stimulates it, that a stronger one causes pain, that a still stronger one deadens the nerve, and that a very strong one damages it. Therapeutically he employed nerve pressures in order to stimulate nerves; owing to lack of records, it is now impossible to obtain precise details as to how or when he executed such pressures, or as to what results he achieved. After his death his theories were developed and his work carried on by his pupils and followers, and the employment of pressures on the facial nerve makes its appearance in the list of remedial agents.[4] Neumann [5] specifically mentions that such a pressure on the facial nerve should be maintained for from a few seconds to a quarter of a minute.

Such manipulation, however, did not prove so successful as had been hoped; it fell into discredit and finally almost into disuse. In Hartelius's handbook the only descriptions of nerve pressures are those referring to the arm and leg, and to these barely 20 lines are allotted;[6] facial nerve pressures[7] are referred to but not described. An attempt to revive nerve pressures in Sweden was made by Wide[8] about twenty-five years ago, but his methods differed greatly from those of his predecessors, inasmuch as his so-called "nerve pressings" were, to quote his own words, "more a kind of muscle kneading, and should be replaced by it." No success attended his attempt.

The reason why these nerve pressures failed to produce the desired beneficial effect is, in my opinion, not difficult to find. It lay in the fact that the pressure employed was too great in amount and applied over too long a space of time. From the researches of Bastian and Vulpian,[9] Waller,[10] Luderitz,[11] Mitchell,[12] Francois-

[4] Georgii, "Kinetic Jottings," 1880, p. 73, and the reports of cases in Blundell, "Medicina Mechanica," 1852.

[5] Neumann, "Lehrbuch der Leibesübungen," 1856, part ii, p. 270.

[6] "Lärobok i Sjukgymnastik," 1870, pp. 88, 89; 1892, pp. 88, 89.

[7] *Ibidem*, 1870, p. 184; 1892, p. 185.

[8] "Handbook of Medical and Orthopedic Gymnastics," 1903, p. 68.

[9] *Gaz. méd.*, 1855, 794–795.

[10] *Proc. Royal Soc.*, 1862, 89, and *Practitioner*, 1870, 321–326.

[11] *Zeit. f. klin. Med.*, 1872, ii, 97–120.

[12] "Injuries of the Nerves and their Consequences," 1872.

Franck,[13] Grützner,[14] Zederbaum,[15] Efron,[16] Goldscheider,[17] Herzen,[18] Jacoby,[19] Ducceschi,[20] Calugareanu,[21] Semenoff,[22] Meek and Leaper,[23] and Joffé,[24] we know that a pressure, if applied quickly, stimulates a healthy nerve, but that if continued over any length of time, it diminishes its activity. It is quite reasonable to suppose that in diseased nerves (*i.e.,* those with diminished vitality) an even much briefer amount of continuous pressure applied daily at or about the same spot would be sufficient to further reduce their vitality. Moreover, any pressure, if not instantaneously removed, would cause venous and lymphatic stasis and temporary anæmia in and around the nerve, and so would still further aid in reducing its function by impairing the nutrition.

These considerations make it clear, however, why the old nerve pressures were actually employed for neuralgic and spasmodic affections of nerves, inasmuch as they diminished their excitability. Equally it explains why, as regards conditions of paralysis and anæsthesia, they were useless in the great majority of cases, indeed, sometimes only making matters worse.

It was during the latter part of the sixties that a new efficacious and rational method of direct manipulation of the nerve was evolved. Henrik Kellgren instinctively concluded that what was needed was a mechanical stimulation of nerve applied in such a manner that none of the detrimental results from continued pressure would arise; guided by this principle, he systematized a method of "nerve friction." At the same time he also elaborated various methods of nerve vibration. These manipulations have been employed by him and his pupils during the past forty years and more, and a large number of cases of facial paralysis have been successfully treated in this way.

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[13] *Compt. rend. Soc. de biol.*, 1880, 86–88, and *Gaz. méd. de Paris*, 1880, 164.
[14] *Arch. f. d. ges. Phys.*, 1882, xxviii, 130–178.
[15] *Arch. f. [Anat. u.] Phys.*, 1883, 161–189.
[16] *Arch. f. d. ges. Phys.*, 1885, xxxvi, 467–517.
[17] *Ibidem*, 1886, xxxix, 96–120.
[18] *Ibidem*, 1886, xxxviii, 93–103.
[19] *Journ. Nerv. and Ment. Dis.*, 1885.
[20] *Arch. f. d. ges. Phys.*, 1901, lxxxiii, 38–71.
[21] *Journ. de phys. et path. norm.*, 1901, 393 and 413.
[22] *Arch. f. d. ges. Phys.*, 1903, c, 182–189.
[23] *Amer. Journ. of Phys.*, 1910–11, xxvii, 308–322.
[24] *Arch. f. [Anat. u.] Phys.*, 1910, Suppl., 467, 468.

Technic of the Treatment.—This is essentially the same for all forms of facial paralysis, and consists of: (*A*) manual stimulation of the facial nerve; (*B*) active or resisted exercises for the paretic muscles; (*C*) stimulatory passive manipulations for the above muscles; to which must be added, but for peripheral paralysis only: (*D*) vibrations over the mastoid process.

General constitutional treatment should, of course, be employed whenever advisable; increased general vitality is a powerful factor in aiding the patient's recovery.

(*A*) *Manual stimulation of the facial nerve:* Before applying any forms of this, the nerve should be exactly located, either from knowledge of topographical anatomy, or, whenever possible, by the sense of touch, and the exact spot determined for applying the treatment. The operator then has the choice of one of the following forms of stimulation: (*a*) stationary frictions, *i.e.,* frictions applied continually at one spot; (*b*) running frictions; (*c*) energetic running vibrations; these are applied in series moving along the line of the nerve in its long axis; (*d*) a combination of *b* and *c*.

(*a*) Stationary frictions: The portion of the operator's hand which actually executes the friction is the back of the tip of the nail of either the first or second finger (supported by the thumb, if necessary) or the back of the tip of the nail of the thumb (supported by the finger, if needful). The joints of the digit should be slightly flexed. In rare cases, where there is great hyperæsthesia or from other causes, the operator may use the finger-tips of the approximated forefinger and thumb, and so execute the frictions partly with the nail and partly with the pulp of the digits.

Thereupon the digit (or digits) is moved across the nerve at right angles to its long axis, a slight amount of pressure being applied at the same time, and this is best effected by means of further flexion of the joint of the digit, not so much by movement of the hand and forearm *en masse.* It must here be insisted upon that it is of the utmost importance that the skin of the patient and the manipulating digit should move as one over the nerve, as otherwise merely a scratch of the skin results, the nerve being left absolutely unaffected. As soon as the nerve has been traversed, the pressure is released; then either a nerve friction is applied in the same manner, but in the reverse direction, thus arriving at the original position, or the nail is

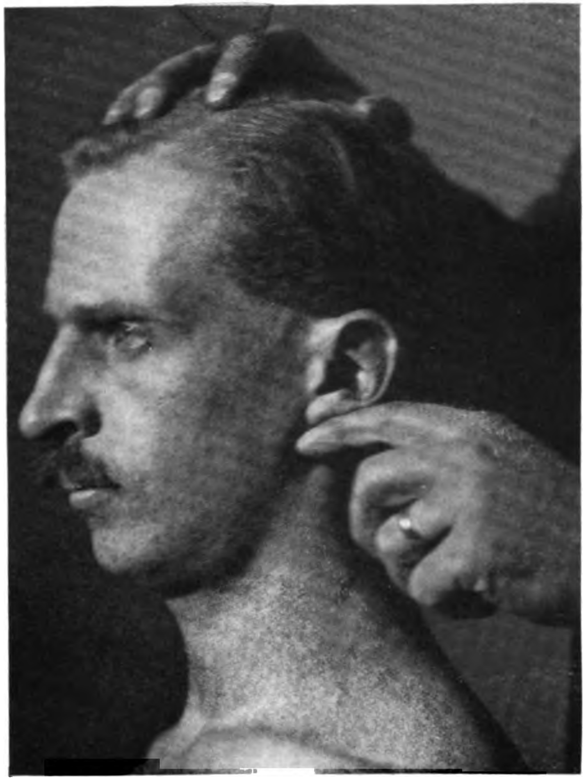
merely passed lightly back to it. The manipulation is repeated several times, each individual friction occupying about a quarter of a second.

The spots where stationary frictions can conveniently be applied to the facial nerve are: (*a*) Behind the ascending ramus of the jaw about one inch above the angle (Fig. 1 shows this being done with the index-finger); (*b*) just in front of this point on the ascending ramus of the jaw for about half an inch of its course; (*c*) over the zygoma (as in Fig. 2). With regard to each of these three sites, the operator feels a distinct snap of the nerve as the finger-nail passes across it; the same can be felt and even sometimes heard by the patient. In all these sites the nerve lies against the bone, hence the facility of palpation. In the rest of the face the nerve mostly lies on soft structures and is therefore less easily stimulated by means of stationary frictions. (One caution is necessary: in aiming at the effect just described, Stenson's duct must not be mistaken for the facial nerve; the duct is indeed also palpable, but it lies farther forward and at a slightly higher level.) Stationary frictions can also be applied on the posterior auricular nerve, which can be felt as it passes over the anterior edge of the mastoid process.

As regards the frequency of a series of frictions, one per second is a slow rate, four per second a fast one; the actual rapidity is at the discretion of the operator; experience alone can dictate which speed is to be adopted. In practice it is not found good to continue for any length of time at any given spot; it is much better to execute a few frictions on one spot, then a few on another, and then to interpose, for example, an active exercise for the muscles of the face; by a judicious use of such alternations the amount of stimulation is never overdone.

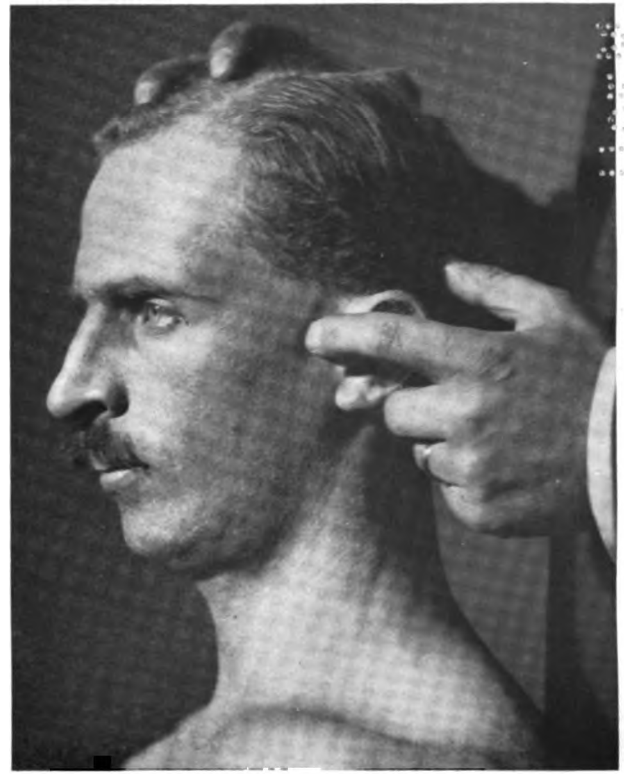
(*b*) Running frictions: The tips of the approximated finger and thumb are placed in the position already described as an alternative for stationary frictions. The digits can then move either in unison with the skin over the underlying nerve, or, as the nerve lies so superficially, across the skin. The former method should be employed for frictions applied along one particular branch of the nerve, the latter when several branches are to be stimulated simultaneously. The finger and thumb, starting from the periphery of the nerve (forehead, nasal area, chin), move in a zigzag direction

FIG. 1.



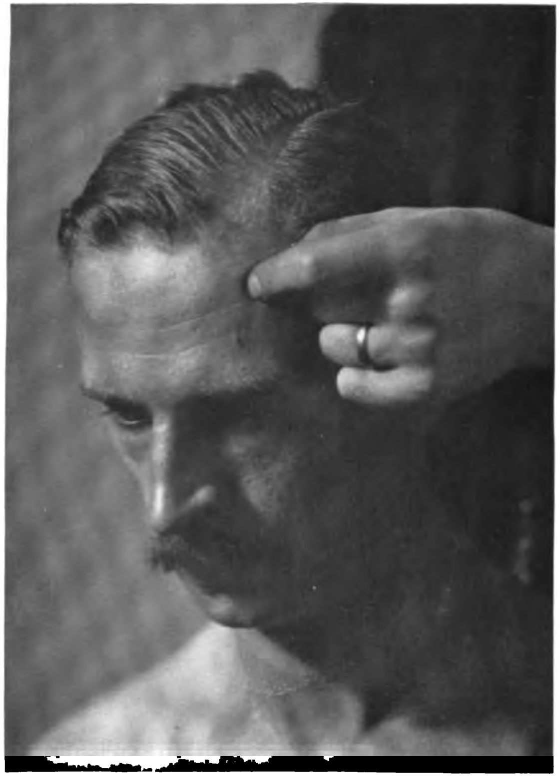
Frictions on the facial nerve behind the ascending ramus.

FIG. 2.



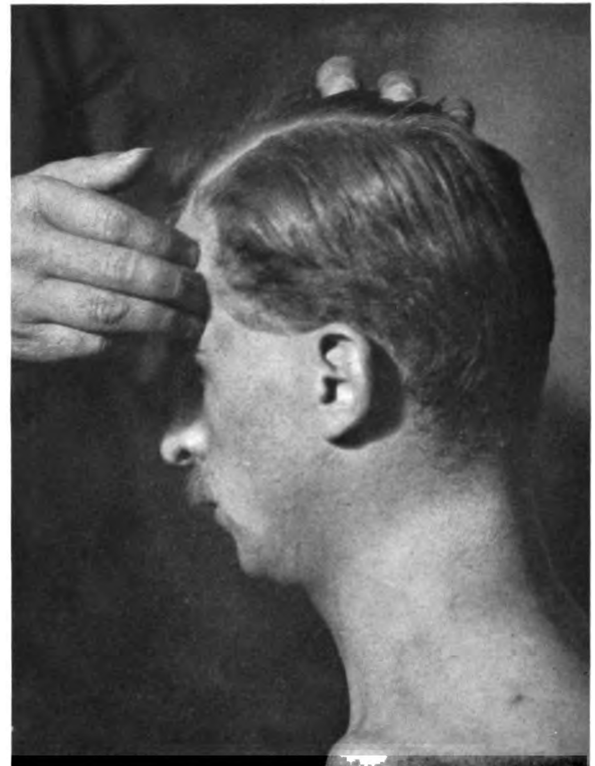
Frictions over the facial nerve in its course over the zygoma.

FIG. 3.



Running frictions over the temporofacial branches of the facial nerve.

FIG. 4.



Running vibrations over the temporofacial part of the facial nerve.

across the long axis of the nerve, the movement terminating at the point where the main trunk lies on the ascending ramus of the jaw. They can also be moved, starting from the occipital region, downward and forward to the anterior edge of the mastoid process, in order specially to stimulate the posterior auricular branch of the facial nerve. The more rapid the onward course of the manipulation, the less would the direction of each individual friction make of a right angle with the nerve; therefore in most cases it is best to retard the onward course to such a degree that each individual friction may traverse the axis almost at a perpendicular. Fig. 3 shows running frictions as applied over the temporofacial branches.

Exactly as in the case of stationary frictions, the amount of pressure exerted should be reduced to a minimum. And equally, when applying these running frictions over one branch of a nerve, the amount of pressure applied should be released after each individual friction. In the case of running frictions, unlike that of stationary frictions, the digits, as a rule, do not feel the distinct snap of the nerve as they traverse it, this being due to their rapid movement; the ultimate effect on the nerve seems, however, to be quite as beneficial.

The rate of execution of these running frictions should be two to four per second, and the rate of the onward movement about one or two inches per second. As in the case of stationary frictions, the running ones should not be applied for too long a time over any given area, but should alternate on different areas, or have a different kind of manipulation or exercise interposed.

(*c*) Energetic running vibrations: It is necessary to emphasize the word "energetic," inasmuch as lightly applied running vibrations have only a soothing effect, and therefore would not have any stimulating effect upon the facial nerve. Either the tip of the approximated finger and thumb (as in the case of running frictions) or the back of the nails of two, three, or four fingers is used to apply the vibrations. The joints of the fingers, wrist, and elbow should be left as loose as is compatible with the correct execution of the movements, and the interphalangeal and the metacarpophalangeal joints should be slightly flexed. A rapid alternating contraction and relaxation of some of the muscles of the forearm, in whole or in part, is set up. The amount of muscular force exerted should be reduced to

such a degree that the active muscles are thrown not into complete but into incomplete tetanus. The speed of the actual vibration is from ten to twelve per second, that of the movement onward being about the same as in the case of running frictions. During the performance of the vibration, the finger-tips must remain in contact with the part of the body to be treated; they must not leave it. Were they to do so, the manipulation would resolve itself into a series of slight percussions like a rapid tapotement, and the manipulation greatly lose in effect. Fig. 4 shows running vibrations with the backs of the nails on the temporofacial branches.

On no account should vibrations be produced by means of powerful tetanus of the muscles of the arm and shoulder generally (a mistake which I regret to say is very common). If executed in this way, such a great amount of fatigue speedily ensues that it is impossible to maintain even and continuous vibrations for more than half a minute or so; in consequence the vibrations rapidly become irregular, jerky, unpleasant, and ineffective. Moreover, this method effectually excludes delicacy of perception and certainty of application.

As in the case of running nerve frictions, the digits never elicit the snap of the nerve as they pass over it.

(*d*) A combination of the last two methods may be adopted, *i.e.*, vibrations may be maintained by the hand during the time that the frictions are being executed. According to whichever is allowed to predominate, so may be used the defining phrases "running frictions with vibration" or "running vibrations with friction."

The manipulations described above produce the following effects:

(*a*) Major effects—changes in the length, shape, thickness, and anatomical position of the nerve, with rapid return to the normal. These changes will be of far greater amplitude in the case of frictions than in that of vibrations.

(*b*) Minor effects—torsional, transverse, and longitudinal vibrations in the nerve. Stationary frictions chiefly cause the torsional and transverse varieties; running frictions cause all three; and running vibrations chiefly the longitudinal kind.

The total resultant is mechanical stimulation of the nerve. The classical experiments of Tigerstedt[25] have demonstrated that a

[25] "Studien über mechanischen Nervenreiz," Helsingfors, 1880.

gentle stretching of a nerve causes stimulation, but a more powerful one the opposite effect. Langendorff [26] found that rapid alternative elongation and shortening of the sciatic nerves of frogs and mammals by means of tuning-forks caused them to be stimulated. Axenfeld [27] also used tuning-forks to excite nerves. Uexküll,[28] who experimented with his neurokinet, at first considered that it was the actual vibration that was the stimulant, but later on he concluded that this was erroneous, and that the stimulant was the alternate elongation and shortening, and in particular the abruptness of the movement. Many observers have before and since that time demonstrated that pressure applied *slowly* and continuously can entirely destroy the nerve function without causing any stimulation of it. Boruttau,[29] using Uexküll's apparatus on the vagus, produced inspiratory tetanus. Oinuma [30] and Von Frey [31] came in 1910 to the following conclusions: in order for mechanical nerve stimulation to be effective there must be not only the application of a force producing change in shape, but also the force must be applied as an impulse at a certain rate of speed. Alterations in the relative intensity and rapidity may to a certain extent compensate one another, but increase in the rapidity of the applied force is more efficacious as regards the result than increase in the force itself. It is therefore probable that a very slight change in shape will be sufficient to cause a stimulation if it can but be brought about with sufficient velocity. The amount of change of shape necessary to produce a stimulation is only a small percentage of the diameter of the nerve; the greater the amount, the greater the stimulation, but only up to a certain point, the maximum being attained with a change in shape amounting to some 20 to 50 per cent. of the diameter.

Some observers have also shown that excitation of a nerve causes conduction in both directions; currents of action are found both distally and proximally from the site of stimulation. This is true for motor as well as for sensory nerves. There seems to be no reason

[26] *Centrlbl. f. d. med. Wiss.*, 1882, xx, 113–115.

[27] *Centrlbl. f. Phys.*, 1892, vi, 299–300.

[28] *Zeitschr. f. Biol.*, 1894–95, xxxi, 148–167; 1895–6, xxxii, 438–445; 1899, xxxviii, 291–299.

[29] *Arch. f. d. ges. Phys.*, 1896–97, lxv, 26–40.

[30] *Zeitschr. f. Biol.*, 1910, liii, 303–318.

[31] *Sitz.-Ber. d. phys.-med. gesellsch. zu Wurzburg*, 1910, 5–9.

for doubting that the facial nerve is in this respect like every other nerve, and so it is safe to conclude that the mechanical stimulation of the nerve as I have above described it acts not only peripherally but also centrally, thus tending to stimulate it in its entire length.

The commonest mistakes made by beginners in administering nerve frictions are, first, that the finger applies a great amount of pressure before the friction is executed; and, secondly, that the actual friction is executed by slowly passing the finger across the nerve. This is exactly the reverse of what should be done, as, from the physiological data cited, it can be clearly seen that the nerve tends to become paralyzed in consequence of such a degree of pressure being applied; and that if too slowly applied, the manipulations fail to cause any stimulation of the nerve. As regards the amount of pressure employed, I have endeavored to ascertain in myself what the minimum amount would be; as nearly as can be estimated, a pressure equivalent to one ounce (28 grams) as the finger-nail passes over the nerve as it lies behind the ascending ramus of the jaw (as in Fig. 1) is sufficient for the distinct snap of the nerve to be felt and to induce a mild feeling of stimulation. I would also state, *en passant,* that a friction applied erroneously in the slow and heavy manner just described causes quite a different kind of sensation on the part of the patient; instead of a stimulatory feeling he will experience a dull, heavy ache of an unpleasant character.

(B) Active or resisted exercises for the paretic muscles: As regards active exercises, the patient should himself endeavor to restore those movements which he has lost in consequence of the paralysis. Such endeavors are conveniently made and the movements practised in front of a looking-glass. As the power of movement returns resistance can be applied, although as a general rule even in normal subjects the facial muscles have but little power of acting against resistance.

Let me for the sake of illustration presume that one has a case under treatment where no active contraction in any of the facial muscles results, even from the most strenuous voluntary efforts on the part of the patient. Such a condition does not, however, imply necessarily that the muscles are totally paralyzed. If the operator performs passively the movement of which the paralyzed muscles are incapable, it may be found that the patient can maintain his muscles

in the new position, even if only for a fraction of a second, *i.e.,* a shortening passively induced can be actively maintained. For example, the patient may not be able actively to contract the frontalis muscle, thereby wrinkling the forehead; if, however, the forehead is passively wrinkled by the operator, the patient may be able to keep it wrinkled after the operator has let go. Indeed, it is sometimes found that the patient can appreciably resist the efforts of the operator to elongate the muscles in question, even when no purely active contraction can be effected by the patient's unaided efforts. (Such movements are known gymnastically as *excentric* resisted movements, in opposition to the *concentric* ones during which the patient shortens his muscle against resistance.) It is also a matter of experience that in some cases where none of the above signs of muscular activity can as yet be elicited, attempts to perform the movements are followed by a feeling of fatigue in the muscles involved; this is one of the first signs of return of muscular activity.

(*C*) *Stimulating manipulations for the muscles:* Nearly all books recommend facial massage for cases of atrophic facial paralysis. On consideration, however, it rapidly becomes evident that as the paralysis is primarily in the nerve and not in the muscles, the more any massage manipulation lets the nerve alone, the less will be the resulting benefit. The usual kind of facial massage employed, in which the tips of the fingers are rubbed over the skin of the cheek, is, in my opinion, a sheer waste of time. The more energetic varieties, performed with one finger inside the cheek, whereby the facial muscles are submitted to *pétrissage* proper, are more efficacious, but it would appear only inasmuch as they stimulate the terminal fibres of the facial nerve. Palmen and Rancken's [32] researches show that energetic massage acts partly by stimulating the cells of the parts and partly by bringing about alterations in the excitability of the nerves and their terminal fibres, thereby inducing changes in the discharge from the brain and spinal cord. But the stimulation of the cells of the part cannot be more than transient if the corresponding nerves are paralyzed; thus in cases of facial paralysis massage of the face muscles can only take effect in proportion as the facial nerve is stimulated and is recovering. Therefore it is much better to stimulate the nerve directly by means of nerve friction.

[32] *Skand. Arch. f. Phys.,* 1909, xxi, 383–404; also Rancken, *Tidskr. i Gymn.,* 1911, xxxviii, 237–273.

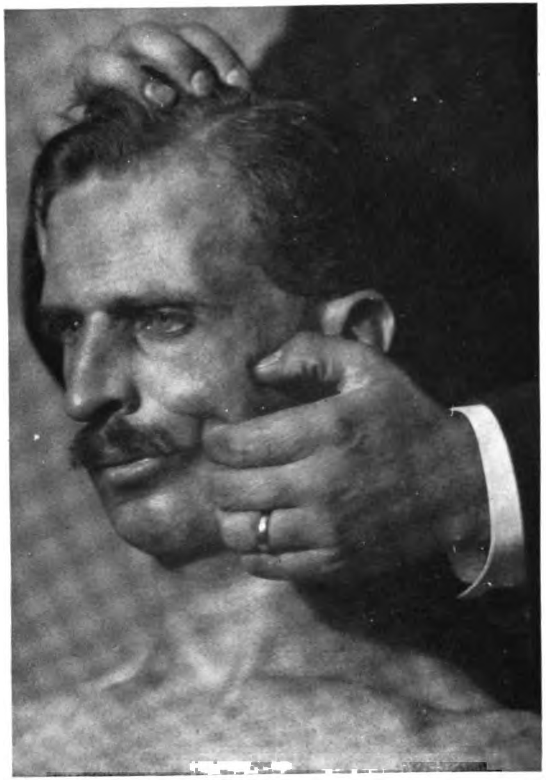
The only kind of stimulatory manipulation that is of any benefit to the facial muscles is one in which the operator places the muscles in the position they would occupy if able to contract, and then relaxing a little brings them by a sharp movement back to the contracted position. This is effected by placing the thumb at one end of a muscle or group of muscles, and two or more of the fingers (according to the size of the area treated) at the other end. By sharply approximating the thumb and fingers the muscle in question is shortened and receives a kind of jerk. This may be repeated a few times before the patient performs an active movement in order to prepare the muscle about to be involved, at the same time stimulating it together with its nerve. Fig. 5 shows the manipulation being applied to the zygomatic muscles.

Frictions applied like stationary nerve frictions, at right angles across any particular muscle, cannot be regarded so much as a stimulant for the muscle as for its nerves of supply, as also for the terminal branches of the fifth nerve. Certain observers have found that destruction of the sensory nerves of the face caused a certain amount of facial paralysis, but stimulation of the fifth nerve does not seem to have any ameliorating influence on paralysis of the facial nerve, and personally I do not employ such nerve stimulation with this object in view.

(*D*) *Vibrations over the mastoid process, i.e.,* over the facial nerve in its passage through the bony canal: The method of executing these vibrations has already been described under the head of running nerve vibrations. The operator, standing either in front of or behind the patient, places the tips of the fingers (held in the same straight line, and in this case vertically) over the mastoid process (or less commonly just in front of the meatus). Vibrations are then set up; that they penetrate the middle ear is evident, as they may be quite easily felt by a third person whose hand is placed meanwhile against the opposite side of the patient's head. The tendency of these vibrations is to dispel the inflammatory material which is produced by the neuritis and which is causing compression of the nerve where the latter lies in the bony canal. Local congestion will also tend to be removed. Fig. 6 shows the vibrations being applied by the operator, who stands behind the patient.

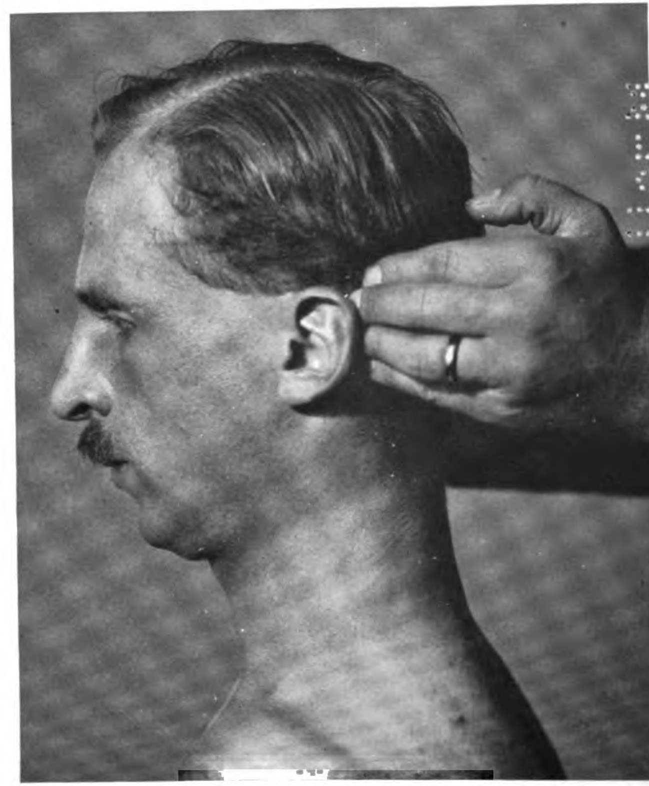
The length of time spent on each of the movements described

Fig. 5.



Stimulatory manipulation for the zygomatic muscles.

Fig. 6.



Vibrations over the mastoid process.

should be approximately as follows, but individualization is, of course, of the greatest importance:

Passive nerve stimulation (frictions and energetic vibrations): five to ten minutes, never dwelling for any length of time, however, at one spot.

Active exercise: This is the most difficult group for which to specify anything definite; it is better to practise often and little at a time than the reverse.

Stimulatory manipulation for a muscle or a group of muscles: a few seconds to a minute.

Vibrations over the mastoid: five to ten minutes.

The above treatment should be undergone daily; in very severe cases it may be of advantage to apply the passive nerve stimulation twice a day to commence with. As regards the active efforts of the patient to perform the various facial movements, these can with advantage be repeated two or three times a day, or even oftener, always taking care that no particular movement is practised too long, as fatigue so easily occurs.

The immediate and remote results of the treatment may be considered as follows:

(a) Immediate: In normal subjects a series of consecutive frictions on the facial nerve (sometimes even one is sufficient) causes a peculiar radiating sensation in the cheek and face generally; in some cases similar sensations may result in the pharynx and ear. Actual contraction of the facial muscles, however, hardly ever results even from repeated energetic frictions on the facial nerve. In case of facial paralysis these phenomena are not quite the same. The amount of sensation induced by the friction may be increased and to by no means an inconsiderable extent. Sometimes such nerve frictions may set up a tonic contraction of the muscles of the face in whole or in part; this contraction is sometimes a little unpleasant and may persist from a few seconds to half a minute after the cessation of the frictions. Sometimes after their cessation a feeling of stiffness may be experienced in certain areas of the face which are quite paralyzed; this is a good sign, and as a rule immediately precedes return of movement in those areas. This is analogous to the similar sensations experienced when the patient endeavors to perform active movements, as mentioned above.

(*b*) Remote: Up to the present I have not met with a case of facial paralysis that I have been unable at any rate to benefit. Even cases that had lasted for as much as two years with but little improvement have improved under the nerve friction treatment so much that finally no deformity was visible when the face was left still; in some cases, indeed, I have been able to effect a complete cure. The worst case of facial paralysis I ever had to deal with, and, as can be seen from the description, even here a certain amount of improvement resulted, was as follows:

Miss X, aged fourteen, fell through a skylight a vertical distance of some 20 feet, alighting on her head, and she sustained a fracture of the base of the skull. Immediately after the accident the patient was able to speak a little, and several witnesses testified that there was no facial paralysis. After about twenty minutes, however, it set in and was complete very soon afterward. Patient had great hemorrhage through the nose and mouth and her life was despaired of. She recovered slowly, however, and three weeks after the accident was so much better that electrical treatment for the face was prescribed. Complete reaction of degeneration was present by this time. The battery was employed, generally twice daily, with a little massage at intervals, over an uninterrupted period of two years and three months. After about two months the method of applying the electrical treatment was entrusted to a relative of the patient; in her zeal, however, the relative increased the strength of the current, thinking thereby (in spite of instructions) that more benefit would be derived, and for two years or more the apparatus was being employed to its full strength. In July, 1900, when I saw the patient for the first time, there was the most complete and typical facial paralysis I have ever seen; there was not a vestige of voluntary movement or tone in any of the facial muscles. Hearing was practically normal; there was complete reaction of degeneration.

The manual nerve stimulatory treatment was commenced on July 7, 1900, the electrical treatment being stopped altogether. The contour of the face showed signs of improvement, and in less than four weeks' time there was slight voluntary movement of the muscles at the side of the nose. Improvement continued slowly until February, 1901, when the patient contracted diphtheria and nearly died in consequence; a peripheral neuritis set in, which chiefly affected the anterior tibial nerves, but also the facial nerve, and the condition got worse again. The ground lost, however, was slowly regained, and in the course of the same year most of the muscles of the face had recovered their movements, though not to their full extent. When the face was at rest, it was very difficult to see on which side the deformity was. From January, 1902, onward nothing was done and the condition remained about the same. In April, 1902, nerve anastomosis with the spinal accessory nerve was performed, with no good result, however. Complete paralysis of the face again set in and has persisted ever since, the only result being that on elevation of the shoulder an involuntary contraction of the risorius results; it cannot, however, be contracted voluntarily.

The length of time necessary to effect a cure is to a great extent influenced by the treatment, especially that by electricity, of whatever

kind, and nerve stimulants, such as strychnine. The following holds good: Cases that have improved under the latter methods almost invariably improve far more quickly when the manual nerve treatment is used, not as an addition but as a substitute. Cases that have remained entirely refractory to the former methods usually undergo amelioration with the latter, generally with a difficulty more directly proportionate to the length of the previous treatment than to the time the disease has lasted. By far the most favorable cases are those in which no previous treatment has been undergone, and this holds good even with those of comparatively long standing. I have also noticed that patients who were compelled to discontinue the manual nerve treatment under me, and who have continued with electrical treatment, have improved at a far slower rate than when under my care; in one case, indeed, the improvement not only stopped under the latter method, but the condition even got worse. In one case where, unknown to me, the patient also continued the electrical treatment while coming to me for the manual nerve stimulation, the rate of improvement increased as soon as the administration of electricity was discontinued. The previous administration of facial massage has no effect in modifying the prognosis so far as I am aware.

Before passing on to notes of illustrative cases, I can but give it as my opinion that nerve frictions can effect far more in cases of facial paralysis than the ordinary methods of electricity and drugs, and I can only urge the medical profession to substitute it without hesitation for the ordinary methods, not merely to resort to it as a last hope after all else has failed. I must, however, point out that the actual treatment must either be carried on by the medical man himself or by some one who has received the special training necessary for it. Ordinary masseuses are not to be entrusted with them, inasmuch as the treatment I have described is not a routine one; it needs long experience to acquire and discrimination and judgment in order to know how to modify the treatment from day to day and week by week in order to meet the physiological requirements of the case and its continual alterations.

CASE REPORTS

CASE I.—Mrs. X, aged thirty, was out motoring on October 23, 1910, and caught cold; the following day complete paralysis set in on the right side of the face; hearing unimpaired, but there was loss of taste. The diagnosis of

peripheral facial paralysis was made, and the faradic current was employed twice daily for fourteen days, after which galvanism was chiefly had recourse to. During the ensuing five weeks hardly any improvement resulted, otherwise than that the sense of taste returned. On November 27 Dr. Howell Evans, of London, was consulted, and sent the case to me for manual nerve stimulation.

I first saw the patient on November 28. The ordinary signs of facial paralysis were present on the right side of the face. There was no voluntary movement anywhere in that area; patient could not close her eye; food collected in the cheek and saliva was running out of the corner of the mouth, etc. There was, however, no reaction of degeneration. Immediately after the first nerve friction treatment the patient found herself able again to contract slightly the zygomaticus, to dilate the nostril and pull back the corners of the mouth. On November 30 the power of elevating the eyebrow returned to a slight degree. December 1 the whole contour of the face was better; closure of eye commenced; a good deal of stiffness was felt in the face from this day onward. December 2 cramp in the muscles around the mouth was induced by nerve friction. December 7 patient could quite close the eye for the first time since the commencement of the paralysis. January 7, 1911, steady daily improvement; patient again able to whistle to-day for the first time. March 8, patient practically cured; no deformity visible even when smiling, only on laughing heartily. All the movements on the right side fully established, though not quite so powerful as on the left side. At this date patient unfortunately had to stop the treatment. Owing to various circumstances, the patient had not always been able to undergo the treatment regularly, having actually received 58 séances during ninety-four days.

Case II.—This was the case of a medical man, Dr. Campbell Ross, who has kindly allowed me to publish his case, and who has favored me with his own notes on it. In consequence of the patient reading for an examination, the treatment had to occupy as little time as possible; the manipulations employed were exclusively nerve friction. Thus the results of the case rest on the merits of this one form of treatment alone. His notes are as follows: "In September, 1902, being up for an examination at the time and rather run down, I caught cold sitting beside an open window; an attack of facial paralysis supervened on the right side. It presented all the usual symptoms; no voluntary movement at all was present, the angle of the mouth could not be moved up and down, the lips could not be pursed up, the forehead could not be wrinkled, the eye could not be completely closed, etc. The buccinator was involved and food collected between the cheek and gum and occasionally was extruded at the angle of the mouth. Taste was lost on the right side of the tongue and sensation was diminished; the affected area of the tongue was white and coated, the rest being clean. The tongue was not deflected and the uvula and palate were not involved. Pain was present over the mastoid for a day or two, and for this blisters were applied in front of and behind the ear. The pain disappeared in a day or two, and electrical treatment was resorted to. There was no response to faradism, and the galvanic response was very sluggish; the reaction of degeneration was fully established after three weeks.

"There was no return of voluntary movement until the end of December, 1902, when slight contraction of the zygomaticus was noticed; it slowly improved, and in January, 1903, the eye muscles exhibited a little activity. About the middle of January, 1903, the galvanic electricity was given up and high-

frequency currents substituted. In March, 1903, slight movement commenced in the muscles of the forehead. At the end of that month, however, the muscles were commencing to contract and the histrionic spasm was present. This was aggravated both by electricity and attempts at massage, and in consequence the electrical treatment was stopped. At this time there was no response to faradism.

"From then until January, 1907, no treatment was resorted to. Improvement took place very slowly indeed, so that at that time the condition was as follows: the eye could be closed, but ptosis was present; the forehead could be slightly wrinkled; the corner of the mouth could be drawn up, but when doing so the eye closed, and *vice versa*. The buccinator now prevented food accumulating in the cheek. There was no movement at all in the muscles of the nose, nor in the depressors of the angle of the mouth, the levator menti, and there was no nasolabial fold. Taste and sensation had returned; a good deal of epiphora was present, which was much benefited by having the lachrymal duct syringed out. In February, 1907, I happened to be applying electrical treatment to a patient, and I tried it on myself; I found that I could get faradic response in almost all the muscles."

Patient consulted me on April 16, 1907, and I found the face in practically the same condition as described by himself in January, 1907. I treated him twenty-nine times between April 17 and May 22; marked improvement resulted, so that on the latter date the condition was as follows (I again quote from the patient's own notes): "All the movements of the face were much improved; coördination was better, so that I could smile without movement of the eye and *vice versa*. In addition, voluntary movement had returned to the muscles of the nose, depressors of the angle of the mouth, and the levator menti. Ptosis hardly present any more and no longer epiphora unless after prolonged exposure to cold wind. Nasolabial fold has returned."

Unfortunately the treatment had to be discontinued in consequence of the patient leaving town, but I am convinced that further improvement would have resulted. The last report from the patient, dated November 15, 1911, is as follows: "The movements of the right side have continued to improve, especially as regards the tone of the muscles. Cold winds do not affect the face so much as formerly. Ptosis is gone and there has been no epiphora lately."

CASE III.—Mr. H., aged forty-eight, who has had glycosuria for the last thirty years, had been suffering from business worries, had also been house-hunting, and was in a very nervous state. On July 20, 1898, he suddenly noticed difficulty in whistling; on the 21st he had right-sided facial paralysis. I first saw the patient on July 22; there was complete paralysis of the right half of the face, no voluntary movement possible; liquids ran out of the corner of his mouth, etc. Taste and hearing were normal, no deviation of the palate. July 23, contour of face better. July 24, slight return of movement at the angle of the mouth. On July 27 movement of the orbicularis oris returned. Steady improvement continued until August 22, when the patient was practically entirely cured, but at his own request he received four more treatments between that date and September 5. His face has remained well ever since.

CASE IV.—G. A., aged seven, an undersized boy, suffering from congenital heart disease, inguinal hernia, and undescended testicle, caught cold on August 10, 1898; on August 11 complete right-sided facial paralysis set in. The face was

smooth, the right eye open, considerable lachrymation. No voluntary movement possible in any part of the right side; taste and hearing were normal. August 11, manual nerve treatment commenced. August 20, patient could smile a little on his left side; August 22, the occipitofrontalis could be wrinkled. Power of all movements gradually returned, and on September 10 everything was normal with the exception that the eye could not yet be closed properly. Circumstances then rendered it necessary to suspend the treatment until October 6, when it was resumed by my colleague, Dr. A. Möller, who cured the remaining weakness in three weeks. The face has remained quite well ever since.

Case V.—H. A., female, aged thirty-nine, had suffered from heart disease since 1876; after influenza, in March, 1899, there resulted an embolus into the internal capsule, resulting in complete paralysis of the left side of the body (face, arm, and leg), with transient aphasia lasting twenty-four hours. I first saw the patient in May, 1900; she showed all the symptoms of left-sided hemiplegia, which I need not describe in detail, except as regards the facial nerve. There was still partial paralysis of the left side of the face, which latter had not the same contour as the right side; movements had returned in all the muscles, but were not so strong as on the right side. When not smiling, the corner of the mouth was pulled a little over to the other side and was constantly a little dropped, there were fewer wrinkles on the forehead, only very slight wrinkling of the nose was possible. When smiling, the left side of the mouth remained stationary. Saliva did not run out of the corner of the mouth. After seven days' treatment of re-education exercises, general nerve stimulation for the leg and arm, and local facial treatment such as I have described, the facial paralysis had quite disappeared; it was impossible to tell on which side it had been originally, and the condition remained well until 1905, when I lost sight of the patient. I may here state that the condition of the arm and leg improved only very slowly as compared with the face.

HEXAMETHYLENAMINE IN AURAL SURGERY

BY P. TETENS HALD, M.D.

Privatdocent in the University of Copenhagen; First Assistant Surgeon, Ear and Throat Clinic of the Kommune-Hospital, Copenhagen, Denmark

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In April, 1909, Crowe published his researches on the excretion of hexamethylenamine in the cerebrospinal fluid, and stated that after therapeutic doses it regularly appears in the liquor cerebrospinalis, where it may produce an inhibiting effect on the growth of micro-organisms. The possibility, thus opened up, of influencing cases of otogenic meningitis by the administration of the drug struck my attention, and I decided to test its efficacy on the clinical material of the Ear and Throat Clinic of the Kommune-Hospital, kindly placed at my disposal for this purpose by the director of the clinic, Professor Holger Mygind.

As to the clinical results obtained by the administration of the drug, Crowe stated that its prophylactic importance seemed fairly well demonstrated, owing to the complete absence of meningitis in quite an extensive series of cases of compound fracture of the skull, gunshot wounds of the head, and cerebrospinal fistulæ, to which it had been given in daily doses of 30 to 60 grains. He also suggested the advisability of its administration as a prophylactic in cases of extracranial suppuration, when extension to the meninges might be feared, for instance, in otitis media.

Among later investigators Rowell, Brem, and Ibrahim have published observations believed to show a beneficial action of the drug in cases of meningitis. These observations, however, are in my opinion not very conclusive. In the case recorded by Rowell the diagnosis of meningitis seems very doubtful, as no lumbar puncture seems to have been performed. Brem's patient, who was suffering from meningococcus meningitis, eventually died after a somewhat prolonged sickness (fourteen days). Neither have these two authors, nor Ibrahim, given any proof of the efficacy of the drug. But we must, of course, at the same time, admit that it is difficult

to establish a real proof in clinical questions of this sort, as I shall show later on. Stockmayer, if any, may possibly be said to have shown the probability of hexamethylenamine influencing the course of a cerebrospinal meningitis; but also in his case the absence of lumbar puncture is to be deplored.

My own researches may be divided into two sections. In the first section I have investigated the laws governing the resorption of the drug and its excretion in the cerebrospinal fluid in human beings of different ages, with or without intracranial affections. These researches I fully published in the *Archiv für experimentelle Pathologie und Pharmakologie* some months ago. Of the results I shall here give only the following:

1. Hexamethylenamine may be demonstrated in the cerebrospinal fluid three-quarters of an hour after its administration. An identical dose, when injected subcutaneously, results in a far greater concentration of the drug in the cerebrospinal fluid than when given by mouth.

2. From the first to the fifth hour after the administration of the doses employed (16 grains in adults, 8 grains in children) the concentration of hexamethylenamine in the cerebrospinal fluid fluctuates between 1: 20,000 and 1: 50,000. Then the concentration decreases slowly. After twenty-four hours it is only 1: 400,000. Forty-eight hours after the administration of hexamethylenamine its presence can no longer be demonstrated in the cerebrospinal fluid.

3. The concentration of hexamethylenamine in the cerebrospinal fluid is relatively considerable, as the amount to be found at the same time in the blood-serum is only two to four times greater.

4. Cumulation of the drug in the cerebrospinal fluid as a result of reiterated therapeutic doses cannot be shown to take place.

5. After an identical dose the drug is found in identical concentration in normal and in pathologically altered cerebrospinal fluids.

The second part of my researches, the one which I am going to treat more extensively here, has for its object the use of hexamethylenamine as a prophylactic or curative means in otogenic meningitis.

I at once saw clearly that if the drug should not—against my expectation—prove to possess a distinctly amazing efficacy, then it would be necessary to test it in as many cases as possible. In this

way only one might hope to exclude the influence of chance on one side, and on the other side to observe cases in which the possible effect of the drug should manifest itself. *A priori,* it seemed probable that conclusive cases—if the occurrence of any such could really be hoped for—would be rare indeed, as in nearly all cases of meningitis some surgical interference would be carried out together with the administration of hexamethylenamine. If subsequently the patient improved, nobody would be able to decide whether the improvement be due to medicine or surgery.

The first question to be answered was how large doses of hexamethylenamine were permissible during the period in which the drug would be administered, *i.e.,* forty-eight hours to some few days. It is with a purpose that I form the question in this way, because it soon turned out that although no cumulation can be demonstrated in the cerebrospinal fluid, the drug undoubtedly has a sort of "cumulative" effect on the kidneys, the administration through a somewhat prolonged period of otherwise innoxious doses not seldom resulting in strangury, hæmaturia, or albuminuria. For the space of time mentioned—a few days at the utmost—the administration of 16 grains four times daily in adults was tolerated, practically speaking, without exceptions, and correspondingly smaller quantities in children. I feel bound to warn against the enormous doses employed by Brem (210 grains daily in gonorrhœal arthritis).

The researches with hexamethylenamine took their beginning in this clinic in June, 1909. Since then the drug has been administered to considerably more than 200 patients, on whom major aural operations have been performed, such as simple mastoidectomies, tympanomastoid operations, craniotomies, incisions of the dura mater or cerebrum, resection of the sigmoid sinus, etc. Among these were fourteen patients suffering from otogenic meningitis, to whom hexamethylenamine was given.

Now, it seems possible in two ways clinically to prove or make probable the efficacy of hexamethylenamine in meningitis. If, as is the case with Crowe, one has observed that an extensive series of cases, otherwise not rarely resulting in meningeal complications, runs its course without the appearance of such complications after the administration of the drug, then one may to a certain extent reasonably consider this fact due to the prophylactic action of the drug

employed. In how many of our 200 and odd cases hexamethylenamine has possibly acted as a prophylactic in this respect it is of course impossible to tell. One thing is, however, certain, *viz.*, that we have observed at least two cases, without meningeal symptoms before the operation, develop a fatal meningitis subsequent to incisions of the dura mater, although hexamethylenamine was administered immediately after the operation. Therefore I feel sorry that I cannot express myself with the optimism of Crowe as to the prophylactic value of hexamethylenamine in meningitis. At the same time I will not go so far as to deny that it possesses such a value.

The second possibility of ascribing with reasonable probability some efficacy in meningitis to hexamethylenamine is to be found in those cases where the condition of the cerebrospinal fluid improves or becomes worse, according as the drug is being administered or discontinued—the case being at the same time interfered with in no other wise. To this class of cases appertain two of our meningitis patients; the following short case record may serve as an instance:

E. P. A. (November 1, 1910), twenty-eight years. Was admitted on September 13, 1909, to the Ear and Throat Clinic of the Kommune-Hospital, Copenhagen. Chronic middle-ear suppuration on both sides; apathy, slow cerebration; paresis of the right oculomatorius (pronounced ptosis); Kernig's sign doubtful. No destruction of the labyrinths. Slight fever. Two hours after the admission lumbar puncture No. 1: pronouncedly turbid cerebrospinal fluid under high pressure, containing numerous polynuclear leucocytes, very few mononuclear lymphocytes, no micro-organisms. In the course of the following tympano-mastoid operation the dura mater was found hyperæmic and covered by fibrinous deposits over the region of the tegmen antri et tympani. Incision of the dura mater and temporal lobe failed to reveal any cerebral abscess.

Sept. 14: Slight rigidity of the neck and Kernig's sign. Hexamethylenamine, 16 grains five times a day.

Sept. 17: Neither rigidity of the neck nor Kernig's sign. No drowsiness any more. Ptosis less pronounced.

Sept. 18: A small hernia cerebri of the temporal lobe has formed itself. Lumbar puncture No. 2. Limpid liquor, containing a considerable amount of mononuclear lymphocytes, very few polynuclear leucocytes, no micro-organisms. Hexamethylenamine discontinued.

Sept. 20: Is getting on fairly well. The cerebral hernia increased.

Sept. 21: Somewhat drowsy. Lumbar puncture No. 3. Liquor very turbid, contains numerous polynuclear leucocytes, few mononuclear lymphocytes, no micro-organisms. Hexamethylenamine, 16 grains five times a day.

Sept. 23: Very much worse. Ptosis more pronounced.

Sept. 24: Lumbar puncture No. 4. Liquor nearly limpid, contains a small amount of mononuclear lymphocytes, very few polynuclear leucocytes, no microorganisms.

The general health of the patient became gradually worse until after the incision, on September 27, of an abscess in the cerebral hernias, when she slowly improved. She left the clinic, fully recovered, on January 1, 1910.

In this case the second lumbar puncture showed a very pronounced improvement, when compared with the first, but I am not prepared to state whether the improvement be partially due to the administration of hexamethylenamine or wholly to the operation. Three days after the subsequent discontinuance of the drug the condition of the cerebrospinal fluid has become decidedly worse, the fluid again being very turbid and having changed its lymphocytary cytologic formula for a leucocytary one. But after renewed administration of hexamethylenamine the fourth lumbar puncture presents a striking improvement of the meningeal process, although the patient has not been interfered with in any other manner, and although her general state of health is slowly becoming worse; the cerebrospinal fluid is nearly limpid again, and its rare corpuscular elements are practically all lymphocytes. It would seem reasonable, in a case like this, to suppose that the renewed administration of hexamethylenamine has really succeeded in counteracting the meningeal process, caused by the abscess in the cerebral hernia. The bad general state of health of the patient improved only after the incision of the cerebral abscess.

According to my experience, one may feel justified in considering hexamethylenamine as a drug which may with some probability be expected to prove helpful in some cases of otogenic meningeal complications, although it will certainly turn out unsuccessful in the majority of cases. As, furthermore, in otogenic meningitis we must be on the lookout for any means of improving the prognosis, a trial of what hexamethylenamine will do for us is indicated. It is to be given in doses of 16 grains four times a day to adults, correspondingly smaller doses to children, for a few days at the utmost; the urine must be examined for albumin every day during its administration. As a prophylactic it ought to be given some hours before the operation in question. If the patient is suffering from vomiting or cannot be made to swallow, the drug may be safely in-

jected subcutaneously in the same doses, the solution being one of 7 per cent. strength. Subcutaneous injection insures a stronger concentration of the drug in the cerebrospinal fluid than the administration per os, and ought therefore to be preferred in cases of manifest meningitis.

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SOME SUGGESTIONS TO THE PHYSICIAN WHO DISPENSES

BY DANIEL M. HOYT, M.D.

PHILADELPHIA, PA.

I THINK it safe to say that one-half of the physicians of the present day do their own dispensing. In fact, outside of our large cities this is practically a necessity for the majority of general practitioners. Country drug-stores are few, far between, and, unfortunately, likely to be very unreliable. If a doctor be called out late at night, and must drive several miles to see a patient, this patient expects to be supplied with the required medicine—not to have a prescription written that means a journey to have filled. It is important that the physician understand the use and value of the U. S. P. and N. F. preparations, but the man who must dispense his own medicines wants, further, to know how he can carry his drugs in a compact, yet active, form, within a reasonable expense.

In the medical schools this subject is seldom spoken of, and a year's hospital training usually gives little help along this line to the young physician, because the hospitals are likely to use set formulas that are designated by numbers or local names. When, now, the physician begins to dispense from his own office, and must decide what he will dispense, he is largely influenced by a group of well-trained salesmen representing large manufacturing druggists, who often present him with a case filled with prettily colored tablets and containing the most elaborate combination of drugs, under attractive and apparently helpful names, such as antidyspeptic, antirheumatic, antineuralgic, cystitis alkaline, cystitis acid, etc.

Some time ago I was quizzing a physician of several years' standing on the subject of therapeutics, that he might take the state board examination where he wished to practise. He said to me one day that he could not see any value in learning therapeutics nowadays, because the indications for drugs were usually written on the outside of the bottle. This is but a very exaggerated illustration of the

dependence some men have upon the manufacturing chemists. Many of the tablets furnished by them do contain active ingredients, but they often consist of five or six drugs in minute and useless quantities. As a man begins dispensing, so he is likely to continue. If he makes a diagnosis of dyspepsia he prescribes his antidyspeptic tablet; if rheumatism, then antirheumatic, and so on. The large manufacturing houses publish not only elaborate catalogues, but also abstracts of current literature covering the newer therapeutic agents. These are often of decided value, but should be taken with a grain of salt, so to speak, because the conclusions reached must, to some extent, be influenced by the desire of their authors to sell the product. The general practitioner should be better able to judge for himself, along therapeutic lines, of the real therapeutic efficiency of the substances thus advertised.

A graduate of one of our large medical schools once said to me, "Why, I know much more about doing a hysterectomy than about writing a prescription." I asked him why this was. He answered, "I was never taught prescription writing." Surgery is a wonderfully interesting and tangible subject. It brings most of its results, good or bad, at once. It is surrounded with certain dramatic and sensational elements which can not be eradicated from the mind of the layman. It is that branch of medicine which brings the greatest financial returns and gives to the physician the largest individual reputation; and it is perfectly natural and right that our young men should strive in the direction of surgery, and it is fitting that our great schools should safeguard their own reputation and the lives of the public by devoting many, many hours to the training of students in surgical technic. But with all the great advance that surgery has made, the majority of cases that physicians meet must still be treated medically.

Has curative medicine in any way kept pace with the great strides made by surgery? If we include the development of our knowledge of mechanical therapeutics, dietetics, internal secretions, and hygienic methods, then we can rightly say that medicine in its advance has kept very close to surgery; but if we are considering the use of drugs alone as curative agents, I think our progress has been much more negative than positive. The science of pharmacology is teaching us, as a result of its laboratory experimentations, much

more what not to do than what to do. It is telling us that we know very little about the action of single drugs in the diseased body, and much less about combinations of five or six, particularly if they be administered in doses so minute that no physiological effect can be demonstrated. It will be at once argued that our methods of experimentation with drugs are as yet crude, and that the minute changes produced in the body by them can not be registered by a writing needle on smoked paper, and this I myself feel to be exceedingly true. It is quite possible that the curative change that is brought about in the body may be the result of some very little thing. I was struck with the remark of Dr. Ernest La Place, of Philadelphia, when he said, "We can cure tuberculous peritonitis by opening the abdomen and then shutting it up again, but we don't know why." Here, then, is an excellent illustration of a cure resulting from an agent of which we have absolutely no understanding. For these reasons we must constantly take into account the great value of careful and skilful clinical observation as to the efficacy of a remedial agent.

The trend of medical thought to-day is to lessen the number of our drugs and to give them for more definite and fixed purposes. The greatest advance in drug therapy of the century is the development of the arsenical compounds by Ehrlich. Arsenobenzol is an epoch-making discovery because it is an etiotropic drug. It strikes at the cause of lues—the Spirochæta pallida. But the great mass of our drugs, so far as we know, simply modify function, and the laboratory, hand in hand with enlightened clinical experience, is teaching us their great limitations.

Now, the relation of all these generalizations to the man who must carry his case of tablets to the bedside, day after day, is obvious. If what he is dispensing is inert, then so far as the medicine itself goes he is not fair to his patient. It is well understood that the personality of the physician and the psychical influence which he exerts upon his case are in many instances a larger factor in the improvement of his patient than the medicine ordered; nevertheless, the latter should be, whenever possible, for a known purpose, and the preparation dispensed should be physiologically active. Further, since the great majority of patients still expect some medicine, and the great majority of physicians still dispense medicines, it is a

practical necessity for many physicians to carry with them such remedies as can be dispensed in tablet or dry form that they may be sure of, and they must know what can be expected of the same.

It is not my purpose to give a complete list of all the drugs that may be required, but rather to point out certain types of substances, and to argue for the use of simple, yet active drugs that may be combined at the bedside to suit each individual case. Take, for instance, magnesium sulphate (Epsom salts)—found in almost every household, sometimes dispensed by the physician,—surely, at first thought, there is nothing new or of practical importance to say about this. That it is the most active of all the salines, that it has an extremely unpleasant taste, and that citric acid in the form of lemon-juice will disguise this taste to some extent, is common knowledge. Yet there are some things about magnesium sulphate that I have found lately are surprisingly little understood by many physicians. It is well known that this substance, if taken before breakfast, will produce purgation; but is this all? If you wish a rapid effect from any saline, give it with a large quantity of water, but do not expect to produce depletion or the lessening of an effusion by this means. When the salt is administered very dilute, being a non-permeable salt, it tends to remain in the gut, and the bulk of water present produces almost immediate peristalsis with resulting purgation, but practically no fluid has been withdrawn from the tissues. On the other hand, if a depleting effect is desired, let the saline be given in very concentrated form with very little water; it will then not produce purgation until sufficient fluid has been drawn from the tissues to cause peristalsis by its bulk. The resultant action will therefore be slower, but much more depleting.

It is sometimes forgotten that citrate of caffeine is not a salt, but a simple mixture of caffeine and citric acid. It was originally included in the U. S. P. because the alkaloid is more soluble in an acid medium. It is not, however, as good a preparation as caffeine alone, which is sufficiently soluble in the stomach when given in the tablet triturate form. The preparation of caffeine most used hypodermically is caffeine sodium benzoate, which should be injected deep into the muscles in 2-grain doses. Both clinical and experimental evidence seems to indicate that caffeine is the best stimulant for the circulation that we have. It is probably superior to strychnine

sulphate because the latter is more likely to be followed by secondary depression, particularly of the respiratory centre, and because caffeine is superior as a brain stimulant and has a more definite stimulative action on the heart muscle. Further, it directly increases diuresis, and thus aids in the elimination of toxins. It must, of course, be used with great caution if there be delirium. The action of caffeine as a diuretic is still under discussion. When I was a medical student we were taught that caffeine was a distinct renal irritant, and should never be used in the presence of an acute nephritis. I think that clinically this is still a safe rule, but it has been lately shown, experimentally, that caffeine, though it produces general vasomotor constriction, causes at the same time a dilatation of the kidney vessels, and that diuresis results because of the increased blood-supply and not from true irritation of the renal epithelium. It is also believed by some that theobromine possesses much less general stimulating action but more local effect in dilating the vessels of the kidney, which would explain the greater diuretic effect produced by this substance.

The use of caffeine for the relief of headache (the drug's action here being not at all well understood) leads me to speak of the common combination of caffeine and the coal-tar products. Of these the most toxic is acetanilide, yet it is the cheapest and still in very common use. The probable cause of the sudden depression sometimes seen after the use of the coal-tar preparations has been shown to be a change in the set of the thermogenic centre. We are learning that fever is an important part of the reaction of the body against a toxæmia. Now, to change this set of the temperature is at times distinctly dangerous. This fact has led us to lessen our dosage of the coal-tar antipyretics, but it does not explain by any means all the cases of sudden depression that follow their use. I have seen two doses of acetanilide, each of 3 grains, given at four-hour intervals to a case of severe myocardial degeneration, produce apparently this most marked circulatory weakness, lasting several hours. I think it best to carry the coal-tar product alone in tablets of 1 or 2 grains, and better acetphenetidin than acetanilide.

Turning, now, to the question of what preparation of digitalis can be carried in dry or tablet form that can be trusted as to activity, we are safe at present in saying that nobody has yet offered us

a preparation of the active principles of digitalis that can certainly be depended upon; so if we want to be sure of an effect, we turn to some of the older preparations of the crude drug. In using them, however, we must remember that the digitalis leaves probably deteriorate with time, so the supply on hand should not be too large. As a general rule, tablets that are said to represent a definite amount of the tincture of the crude drug are to be avoided as unreliable. I think the tincture itself by far the best preparation, if well made, but this is, of course, a liquid preparation. For an active tablet of digitalis I believe that the best that can be done is to have triturates made, each containing 1 grain of powdered Allen's English digitalis leaves. The disadvantages of such a preparation are the difficulties of changing the dose and its likelihood to produce gastric disturbance.

Of strophanthin, a most active glucoside, it may be said that we are as yet undecided how active this substance is when given to the human being by the mouth, that hypodermically it produces marked local reaction and pain, and that intravenously it is a powerful, active stimulant to the heart, but its use is rarely justified in this manner, and then only when digitalis has not been recently given.

Morphine sulphate should, of course, always be carried, but I think only in 1/10-grain dose. A good 1/4-grain tablet of codeine has many advantages over morphine and will often take its place to the benefit of the patient. Codeine has much less habit-forming power than morphine, is eliminated almost entirely by the kidneys, and is not reabsorbed into the gastro-intestinal tract as is morphine, and though the latter is much more effectual in the relief of pain I believe that codeine should, whenever possible, be given the preference. In 1/100-grain atropine tablet we have most of the useful activity of the belladonna plant. The great action of atropine upon the circulation, which is commonly lost sight of, is its power to increase the heart-rate by producing peripheral paralysis of the pneumogastric nerve. This has some importance clinically. If a heart is very slow, but weak and dilated, and rest in bed does not bring about a return of compensation, we often hesitate to use the digitalis group because we fear to further slow the heart-rate. Here atropine, combined with digitalis, is rational because the former will lessen peripheral inhibition, and so increase the heart-rate, while the latter

will stimulate the heart muscle. If, however, the slow heart be due to degenerative changes in the muscle, the atropine will be of little service in increasing its rate. To lessen the irritability of the pneumogastric, atropine must be administered in full dose. Some observers have also shown that atropine is of particular value in relieving shortness of breath when due to some form of pressure or irritation of the pulmonary branch of the pneumogastric nerve, as, for instance, pressure from an aneurism.

One of the vegetable salts of potassium, either the acetate or citrate, should be carried, either in bulk or in tablets of 5 or 10 grains each. To an adult it should be given in at least 20-grain doses for its various indications. I mention this common substance because I had some difficulty in getting it in tablet form.

Much has been written about the varying strength of nitroglycerin tablets. For use by the mouth the gelatin-coated granules are much more active than the uncoated triturates, as can easily be demonstrated by any one who will swallow one of each and note the difference in effect.

For some reason the bisulphate of quinine is very little used by the profession. It is much more soluble than the sulphate, and therefore quicker in its action.

Ammonium bromide may be very conveniently carried in 10-grain tablets, it being a non-deliquescent salt. It should always be administered dissolved in water, as all the salts are distinctly irritant to the stomach. The more common sodium salt, which I think has no therapeutic advantages over the ammonium, soon grows moist and sticky if dispensed in tablet form.

Hexamethylenamine in 7½-grain doses, as an internal antiseptic, is the most rational remedy we have in this line. As is well known, it depends for its activity on the liberation of formaldehyde. It has been found in almost all the excretions, normal and abnormal, and it is of particular value in infected conditions of the bladder. The substance is distinctly irritant, however, particularly to the kidney, and must not be given over too long a period of time without an intermission. It is best administered in solution. The salts of salicylic acid, if carried in tablet form, had best be administered in milk. Bismuth, salol, iron, and other insoluble substances can be perfectly well carried in tablet form provided the physician is care-

ful to test his tablets. This is easily done by dropping the tablet into a test-tube containing cold water. The tablet should almost immediately disintegrate. The menstruum of such tablets is usually some starchy substance which, when it comes in contact with the water, rapidly swells and so breaks up the tablet. It is a good general rule to test all uncoated tablets in this way.

I do not wish to say that it is always best for the physician to do his own dispensing. If his practice is where he has access to a good reliable pharmacist, then the prescription is almost always superior to the tablet or triturate. But where dispensing is a necessity I think the simpler the dispensing the better for the patient. I think, further, that, whenever practicable, we should test on our patients the effects we are getting from our drugs. Every doctor knows how unreliable is the statement of a patient in regard to the effect of a medicine he has been taking. With many of the substances which we use, such as arsenic, the iodides, etc., we have no way of getting at results save through general observation, but when we are giving remedies which affect the circulation, a study of the systolic blood-pressure will often give valuable information, and we may be surprised to note to what a slight extent the blood-pressure is affected when drugs are administered in their common dosage.

SANITARIUM TREATMENT OF TUBERCULOSIS IN PRIVATE PRACTICE

BY J. H. MUDGETT, M.D.
PHILADELPHIA

AT the Boston Meeting of the American Medical Association I investigated Dr. Pratt's "class method" of treating tuberculosis among the poor of Boston, and became so much interested in its possibilities that I resolved to follow out a modified form of his plan in private practice. My results have been so successful that I desire to place this method before the medical profession.

Many physicians still think tuberculosis cannot be arrested or cured, but it has been my experience that if the diagnosis is made fairly early the disease responds to the proper treatment as readily as pneumonia, typhoid fever, or other common maladies. It must not be expected, however, that every case will improve; the value of a given method of treatment for any disease is only to be determined by comparison of a series of cases.

I know of nurses who, having worked in the state sanitariums of Pennsylvania and New Jersey, and who contracted tuberculosis while there, make the statement that it is "no use to try to get well, because all cases die." This seems to me to be a sad commentary upon the real efficiency of such sanitariums.

Diagnosis.—When a patient complains of a loss of weight, say ten to fifteen pounds within two or three months, tired feeling, and slight cough or just clearing the throat, and no other cause for the loss in weight can be found, be very suspicious of tuberculosis. There may be a temperature at night of ½° to 1° above normal. The best way to make the diagnosis, if the patient is an adult, is to take the temperature for two or three days and keep a record, then inject two minims of old tuberculin, diluted with 50 per cent. sodium carbolate solution, hypodermically, and, if the reaction is positive, the temperature goes to 100° or 103°, and the patient complains of pain, headache, and slight nausea, thus proving the case to be one

of tuberculosis. There is generally a slight redness around the point of injection, more than there would be in cases not tubercular, and râles and other physical signs are intensified.

In children the injection should be one minim, or Von Pirquet's test might be used. I do not, however, consider the latter wholly reliable for adults.

Treatment.—An essential point in the treatment is that the patient remain at home. If sent away to a sanitarium, he may improve and return home fat and apparently well, only to relapse and finally die of the disease. Treated at home, in the same environment in which he is going to live after he gets well, he will continue to practise the sanitarium methods which he has been taught, and consequently will remain so. This plan of treatment should also be adopted for those patients who have been compelled to go to a sanitarium, for financial reasons, after they return home, thereby continuing the sanitarium methods and preventing relapse. The patient will then continue to improve until cured or the disease is arrested.

The home sanitarium plan of treatment is as follows: The patient is put in a tent, on the roof or in the yard, as the surroundings may decide. If the patient's means will not permit of the purchase of a tent, one may be procured by taking a soap order of $12, to be sold within thirty days. A 7 x 9 wall-tent will then be delivered to him at once. If there is no suitable place for a tent outside, the next best arrangement is the window-tent. If necessary, this can be cheaply made of two awnings, one outside for protection in case of storm, and one inside that may be pulled down over the bed, so as to include the patient's head and shoulders.

If there is a temperature above 100° at night, the patient should be put to bed. I thoroughly agree with Dr. Pratt, that rest is the best remedy for tuberculosis. The following symptoms indicate rest in bed: (1) fever, (2) hemorrhage, (3) rapid respiration, (4) rapid pulse, (5) loss in weight. Whenever the loss in weight continues in an ambulant patient, he should be put in bed until his weight begins to increase again. I find that the hardest task I have is to convince a patient that he should go to bed when he does not feel ill. An argument sometimes successful for this purpose is to tell the patient to compare his body to a bank. The milk and eggs and nourishment are the money, the disease is the thief that steals some

FIG. 1.

Showing method of using old awning down over the bed in place of a window-tent. The awning outside, seen in Fig. 2, is shown at top of window. Patient's head and shoulders are inside.

Fig. 2.

Showing outside awning, which is let down for protection in case of storm. The character of the house and surroundings is well seen.

of the money, the walking around is the drawing of the money out of the bank. If the thief steals some, and a portion is withdrawn, more is being taken out than is being put in. This comparison appeals to the patient, and helps to induce him to take the necessary rest. I term it the conservation of energy. The rule is, that a patient should remain in bed until the temperature is normal for a period of thirty days, and until there is no blood in the sputum, respiration and pulse are slowed down, and there is an apparent increase in weight.

The visiting nurse is an important factor in seeing that the instructions of the physician are carried out in full. The nurse visits the patients every day or, in some cases, every other day, and teaches them how to take care of the sputum, and constantly lectures to them on the necessity of conscientiously carrying out directions. In cities where there is a Visiting Nurse Society nurses will visit the poor without charge. In other towns and cities a nurse can be paid a small amount for each visit.

It is the duty of every physician to interest the ministers, and show them that tuberculosis can be cured. A tuberculosis society should be started in every church for the purpose of raising money to be loaned to those patients whose means will not allow them to take the rest treatment. The Emanuel Church of Boston, by this method, has returned 200 patients to their former places as self-supporting, useful members of society. If poor patients that are not able to have all the necessities of life, to say nothing of the luxuries, can be cured in their little homes in the back streets, how much better can people of moderate means be successfully treated at home!

There is to be observed in all recent literature a strong tendency to the more extended use of tuberculin. When carefully and intelligently administered, tuberculin, in addition to the ordinary hygienic and dietetic measures, which are now so well known and so generally adopted, constitutes our greatest therapeutic resource. I use the tuberculin injection once a week in all cases, except advanced ones, even when there is a temperature of 102° or 103°. In most instances tuberculin will assist nature and save the destruction of the lung.

Pottenger, in the *Journal of the American Medical Association,* September 16, 1911, says that he uses tuberculin in nearly all cases

in which fever is present. He claims that the fever is due to chemical changes rather than to the mixed infection, but, in my opinion, it is probably due to the mixed infection following the breaking down of the tubercle.

I have obtained good results in reducing temperature by the use of the mixed vaccine. It seems to me that if in incipient cases we used the mixed vaccine with the tuberculin the immunity would be raised to such an extent that the mixed germs would fail to grow and thereby we would, in a measure, anticipate the fever. I give the tuberculin injection once a week, and the mixed vaccine once a week. The best results in cases in which there was fever, and a tendency to a marked reaction after an injection of tuberculin, were gained from the use of a modified form of Koch old tuberculin, made by the St. Petersburg Tuberculin Society, and known as Tuberculinum Purum Endotin. Commencing with series *A,* 1/20 C.c. to a dose, five doses to each serial dilution, I continue with the progressively stronger series *B, C,* and *D;* followed by Denny's solution Nos. 5 and 6 tuberculin emulsion. The same number of injections are given in each instance, of course modifying both the dose and the frequency of the injection according to the needs of the individual patient.

Each cubic centimetre of the mixed vaccine contains:

Staphylococcus albus	150 million
Staphylococcus aureus	150 million
Streptococcus	50 million
Pneumococcus	50 million
Micrococcus catarrhalis	50 million
Bacillus Friedländer	50 million

I use from 1/5 to 2/5 C.c. for each dose in fever cases, increasing until the temperature is reduced to normal and remains normal. In cases with slight fever I commence with Denny's solution tuberculin emulsion, two drops for each dose, increasing from two to four drops at a dose, until twenty drops of each serial dilution is used. But it will be observed that sixty doses of the Denny's tuberculin are required, as compared with twenty doses of the Tuberculinum Purum. I find that the results with the Tuberculinum Purum are both much better and quicker.

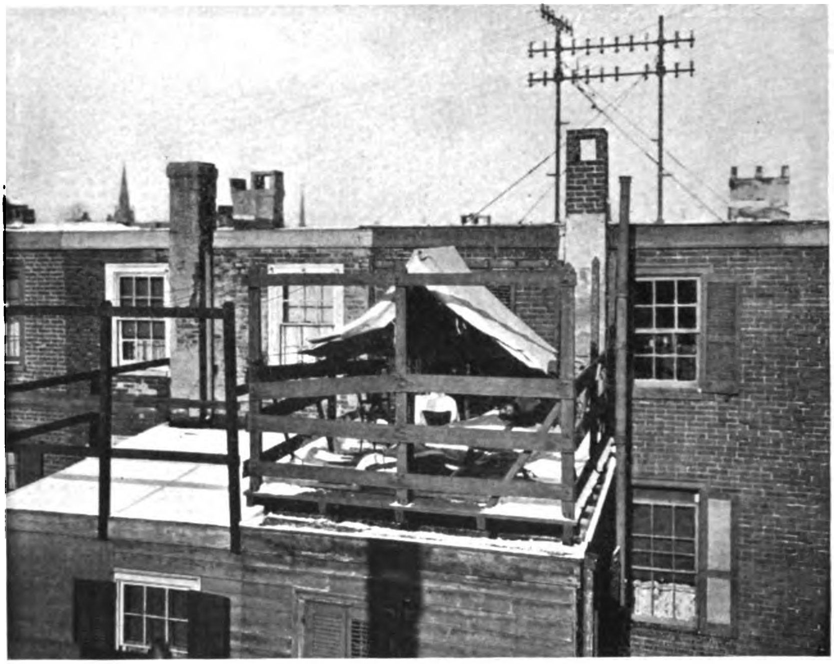
Fig. 3.

Showing back kitchen used for shack after weather was too cold for tent. Patient is seen in bed.

Fig. 4.

Showing outside of back kitchen shown in Fig. 3.

Fig. 5.



Showing patient in tent, third-story flat.

Fig. 6.

Showing tent in back yard, also clothes, belongings of one of our best families, hung in the adjoining yard.

Rayevsky, in the *New York Medical Journal,* November 11, 1911, states that in deciding the kind of tuberculin to be used he is guided largely by the type of the disease present. Patients showing toxicity, fatigue, anorexia, and diarrhœa are treated with Koch's old tuberculin. Since these products are the solutions of the exotoxins of the tubercle bacilli, for patients suffering from the focal effects of the disease, without marked evidence of toxæmia, he prefers bacilli emulsion, believing that it sets up production of antibodies to the tubercle bacillus itself.

He further states that he began to use the Tuberculinum Purum of Gabrilowitch, which is made in the same way as old tuberculin, and purified with ether and other solvents. The claims made for it appeared to be too great for acceptance, and the assertion that it caused no febrile reaction seems inconsistent with the possession of the therapeutic value.

Many European observers claim the fever reaction is not due to the specific principle of the old tuberculin, but to the by-products which are taken out in the purified tuberculin. In order to ascertain what effect the tuberculin had upon the blood, leucocyte count was made in four cases every ten to twelve days. A steady increase was noted. In one case, in which the lymphocyte count at the beginning was but eighteen per cent., it rose to twenty-eight; in another, from fifteen to thirty-two per cent.; in a third, from nineteen to thirty-five per cent.; and in the fourth, from twenty-one to thirty-six per cent.

In my opinion, the best plan is to use Tuberculinum Purum in the beginning, followed by the tuberculin emulsion.

Of course, it is absolutely necessary to carry out all the sanitarium methods for improving the general health. A dose of salts should be given at least once a week. All other symptoms that may arise should be treated symptomatically. I believe that it would be a good business and economic proposition for insurance companies to loan wall- and window-tents to their policy-holders suffering with tuberculosis, and also to furnish a free consultant to aid the general practitioners to make an early diagnosis.

The following records of cases will illustrate the success of this method of treatment:

CASE I.—Mary M., aged 18, colored. Came to my office May, 1909, for treatment. Had lost ten pounds in the past two months. Shortness of breath, cough, râles in the left apex, temperature 102° at night, tubercle bacilli in sputum. Put patient in tent on roof in May, 1909. Gave injections of tuberculin emulsion each week, and kept the patient in bed for two months. Temperature normal after four weeks in bed. Allowed the patient, after leaving bed, to come to my office each week for treatment. Gained twelve pounds, physical signs in the lungs entirely cleared up. Cough and all symptoms have disappeared. Is able to work all the time.

CASE II.—Mr. H., age 28, white. Came to my office for treatment, December 10, 1910. Temperature 102°, plus 134, respiration 36, râles in the left apex, marked lesion, stage second, tubercle bacilli in sputum. Patient had been six months at White Haven. Had been treated by several physicians, both before going to White Haven and after returning home. On the second visit to my office had a hemorrhage, filling a cuspidor half full of blood. Sent patient home in a carriage and put him to bed in a window-tent. He remained absolutely in bed in the tent for six months. After a few weeks in bed, temperature became normal, respiration and pulse slowed down, commenced to take on weight, and showed a marked improvement. At the present time, gain in weight is 31 pounds Is able to work every day as an insurance agent. (Figs. 1 and 2.)

CASE III.—Mrs. B., age 27, white, married. Came to office for treatment May 22, 1911. Gave a history of having had a cough for three or four months. Lost fifteen pounds in weight. Had been treated by another physician for tuberculosis, but only with the sanitarium methods and not with tuberculin. Continued to lose each week under the above treatment. Had the patient sleep on the porch and remain in bed all the time for the first month. Temperature ranged from 100° to 101° in the evening. After the first month, came to the office each week for a tuberculin injection, which had been given weekly from the beginning of the treatment. Patient taking tonics, milk and eggs, nourishing foods, etc. At present time shows a net gain of twenty pounds, and is apparently getting well. This patient gave positive reaction to tuberculin.

CASE IV.—Mrs. K., age 30, white. Came to office for treatment April 6, 1911. Tubercle bacilli in sputum. Had been sick for six years. Cavity in right apex, râles in left apex, had had several hemorrhages. Six months at White Haven, four months at Mt. Alto. Temperature, evening, 101°, pulse 120, respiration 36. No facilities for outdoor tent. Put patient to bed in small room in third story. Sun shone on the roof all summer, but, in spite of the hot weather, kept patient in bed until the middle of October. Gained ten pounds. Advised patient to move. There is a large yard in the new residence, and patient has since slept out in tent. Still improving; gained two pounds last week. This patient has had tuberculin injections each week, except once when too much exercise was taken, producing a hemorrhage. Two or three times have had a marked reaction after an injection, and at such times I usually wait two weeks before giving another injection. (Figs. 3 and 4.)

CASE V.—Y., aged 34, colored, single. Came to office first time July 31, 1911. Temperature 102°, pulse 120, respiration 36. Had a history of losing in weight, cough, expectoration, feeling badly for the past two months. Râles in left apex. Tubercle bacilli could not be found in sputum. After injecting 2 minims of old tuberculin, temperature 104°, pulse 140, respiration 40, pains all

Fig. 7.

Showing patient in the tent in the back yard. Notice the snow on the ground, the present winter in Philadelphia having been an unusually severe one.

Fig. 8.

Showing patient taking cure in steamer chair. This is done for thirty days after the temperature is normal.

over—marked positive reaction. Put patient out in tent on the roof. Kept him absolutely in bed for two months. Gave tuberculin injection each week. At the end of four weeks, temperature normal. At the end of three months allowed the patient to come to office for treatment. At present time is able to attend to business for a portion of his time, and shows a net gain of fifteen pounds, which is up to his normal weight. Still improving.

CASE VI.—K., aged about 43, colored, waiter. Came to office April 27, 1911. Had cough. Temperature 101° to 102° at night, pulse 120, respiration 30. Lost twelve pounds in weight; had been complaining for three months. On examination, showed a spot in right apex. Put patient to bed; used tuberculin injection each week—reaction positive. Patient remained in bed in room for two months, having an afternoon temperature each day of 102°. Had patient removed to tent in open air on the roof. Temperature dropped to normal after four weeks on the roof. At the present time has regained his normal weight. Cough entirely cleared up. Is able to work every day. (Fig. 5.)

CASE VII.—Mrs. H., age 40, white, married. Came to office October 13, 1910. Showed positive reaction to tuberculin. Evening temperature 101°, pulse 120, respiration 32. Put patient to bed for eight weeks, used tuberculin, fresh air, and all the usual sanitarium treatment. At present time patient is perfectly well. Gained twelve pounds.

CASE VIII.—Miss H., age 38. Consulted me in April, 1910. Usual history of loss in weight, cough, expectoration, fever, rapid pulse, râles, and other physical signs. Tuberculin reaction positive. Put patient to bed for four weeks, then allowed her to be up a portion of the day. Usual treatment with tuberculin. Patient regained normal weight, cough and expectoration disappeared. At present, apparently well and working every day.

CASE IX.—Miss L., age 18. Consulted me April 11, 1910. Evening temperature 99½°, pulse 100, respiration 26. Complained of feeling tired, had lost ten pounds in the past two months. Slight cough, clearing the throat constantly, slight cracking sound, jerky respiratory sound in one apex, physical signs not marked enough to make a positive diagnosis. As her sister had been engaged to a patient who was under treatment for tuberculosis, I became suspicious that she had possibly become infected by association. I therefore decided to use a tuberculin test. Kept a record of the evening temperature for three or four days. Used two minims old tuberculin. Temperature went to 102°, pulse 130, respiration 36, pains all over—positive reaction, showing that she had tuberculosis. Kept patient in bed three weeks. Temperature normal. Had her come to office for treatment. In three months patient gained twenty-six pounds, and is now perfectly well.

This case shows the importance of making a tuberculin test in all persons who are in any way associated with tuberculous patients, even though the symptoms appear to be negative.

CASE X.—Mrs. C., age 18, colored, married. Came to office July 15, 1911. Temperature 102°, pulse 120, respiration 36. Put patient to bed in a tent. Usual treatment. Did not show improvement. Temperature did not drop. Patient died December 15.

I cite this case to show that it is almost useless to treat a case of galloping tuberculosis, but, as one cannot tell in the beginning, all cases should be treated by the tuberculin method. This applies as well to those cases coming under observation that are continually catching cold, apparently, coughing, losing weight, and feeling tired. Make a tuberculin test, and see if it is not an early case of tuberculosis. The cure will be comparatively easy if the diagnosis is made early.

CASE XI.—B., age 29, colored, married. Came to office September 16. 1910. Gave history of losing twenty pounds in weight during past six months. Pulse 96, respiration 28. Had had several hemorrhages. On physical examination, found spot in left lung, about the size of a silver dollar. Patient had no temperature to speak of, and I allowed him to come to office for treatment once or twice a week. Treatment by usual method of tuberculin, fresh air, rest, and eggs and milk. January, 1911, patient had gained thirty-one pounds, and was able to return to his work as Pullman car conductor. Cough and expectoration improved.

CASE XII.—Mr. H., age 27, white, married. His weight was 96 pounds, normal weight 130 pounds; carpenter. Was called to see him April 28, 1909. Gave the following history: Had had pneumonia, as pronounced by the attending physician, four months previous, and a marked attack of pleurisy. On examination, found the whole right lung bound down by adhesions, râles and usual physical signs in right apex. Temperature 102°, pulse 120 and 130, respiration 36 and 40. Sputum showed tubercle bacilli. Patient was so weak that we had to carry him on a stretcher. Put him out in tent in yard. He lived in tent one whole year. After four months in tent, his temperature was normal, pulse 100, respiration 24. Continued to improve, and in the end of the year he showed a net gain of forty-eight pounds in weight. He has since worked a whole year at carpenter work in Cramp's shipyard; at the present time he is working at his trade in Utah, as he states in a recent letter.

CASE XIII.—B., age 14, colored. Was called to see him August 23. Temperature 102°, pulse 120, respiration 40. Complained of feeling tired. Had lost considerable weight. Had hacking cough, constantly clearing the throat. Put patient to bed near the open window. Remained in bed two months. After five weeks in bed, temperature normal. Had râles and dulness in left apex. On November 22 showed a net gain of eighteen pounds. Cough disappeared, and, on examination, lung had entirely cleared up, except slight roughening sound on inspiration.

CASE XIV.—G., age 22, colored, young married man. Came to office October 5, 1911. Cough, expectoration, râles in right apex. Small cavity in right lung, which was bound by adhesions. Marked differences, on inspection, of the inspiration of the right side, compared with the other side. Temperature 102°, pulse 108, respiration 36. Tuberculin reaction positive. Tubercle bacilli in sputum. Put the patient in tent in yard the middle of October. Patient remained in the open air in bed for two months. Temperature normal. Much improved. At the present time is allowed to walk around a portion of

the day, but sleeps out in tent every night, with both sides rolled up. The patient shows a net gain in weight of fourteen pounds. Cough, expectoration, and all physical signs much improved. (Figs. 6, 7, and 8.)

Of thirty-seven cases treated, including incipient ones, those in the second stage, and advanced cases (no cases included that came to the office for a short time and then disappeared and no case included that commenced treatment since November 15, 1911), ten died, eighteen working, nine convalescing.

My experience has led me to form the following principles in the treatment of tuberculosis: (1) Patients should be treated at home instead of sending them to a sanitarium. (2) Rest is the best treatment for tuberculosis. (3) Open-air method should be used when possible. (4) Tuberculin should be used in nearly all cases except advanced ones. (5) If diagnosis is made early, a large percentage of cases can be cured or arrested.

Department of Medicine

EXPERIMENTAL POLIOMYELITIS

BY SIMON FLEXNER, M.D.
The Rockefeller Institute for Medical Research, New York

I

ALTHOUGH epidemic poliomyelitis, or, as the disease is also called, infantile paralysis, was first successfully transferred by inoculation to monkeys two and a half years ago, the harvest of new facts which the experimental study of the disease has yielded has been very large. The renewed impulse to attempt the transmission of the disease to some lower animal arose in connection with the pandemic that spread over a large part of Europe and America between 1907 and 1909. The distinction of the first successful transfer of the human disease to the monkey—which is the animal that has thus far proven highly susceptible to inoculation—belongs to Landsteiner and Popper, of Vienna, who published the results of their successful experiments in the spring of 1909. Within a few months of this period, similar successful experimental inoculations in the monkey were reported from America by Flexner and Lewis, from France by Landsteiner and Levaditi, from Germany by Römer, and from Austria by Knoepfelmacher, and Leiner and v. Wiesner. Not only has the subject progressed with rapidity, but the experimental facts elicited in the different centres of investigation have been remarkably uniform; and while priority in respect to the discovery of fundamental facts is to be accorded to one or another of the investigators, yet it is a tribute to the state of advancement of the science of etiology that the direction of the pursuit of knowledge through experiment was so nearly the same in the widely-separated laboratories in which the experiments were carried out. Therefore, in presenting a *résumé* of the present status of knowledge of experimental poliomyelitis, no consistent effort will be made to assign priority of observation, while the names of authors will be given only in connection with special points,

The literature on experimental poliomyelitis is already considerable, and it has been summarized recently by Römer, by Zappert, v. Wiesner, and Leiner, and by Levaditi; but the progress is still so rapid that no *résumé* can contain all the new facts discovered.

II

Landsteiner and Popper introduced into the peritoneal cavity of monkeys emulsions of the spinal cord of patients who succumbed to epidemic poliomyelitis. No immediate effect followed upon the inoculation, but later the inoculated animals developed symptoms corresponding in all essential respects with the symptoms of the spontaneous disease in human beings. The spinal cord of the monkeys exhibited lesions which produced accurately the lesions present in the same organ in the human disease. Hence the proof was brought that experimental poliomyelitis is transferable by inoculation to the monkey. When, however, an effort was made to continue the transmission, using the spinal cord of the affected monkeys to inoculate, by the peritoneal route, still other monkeys, complete failure resulted. It was not until transmission was attempted by means of intracerebral inoculations that successive infection was secured. Indeed, it has been found that when an emulsion of the spinal cord derived from a human case of epidemic poliomyelitis is implanted successfully upon the monkey, the intracerebral mode of inoculation enables an indefinite series of successful transfers of the infection to be accomplished. Up to the present time, successive transfer has been made through large series of monkeys, in one instance approaching one hundred generations of the infectious agent, without obvious loss in activity.

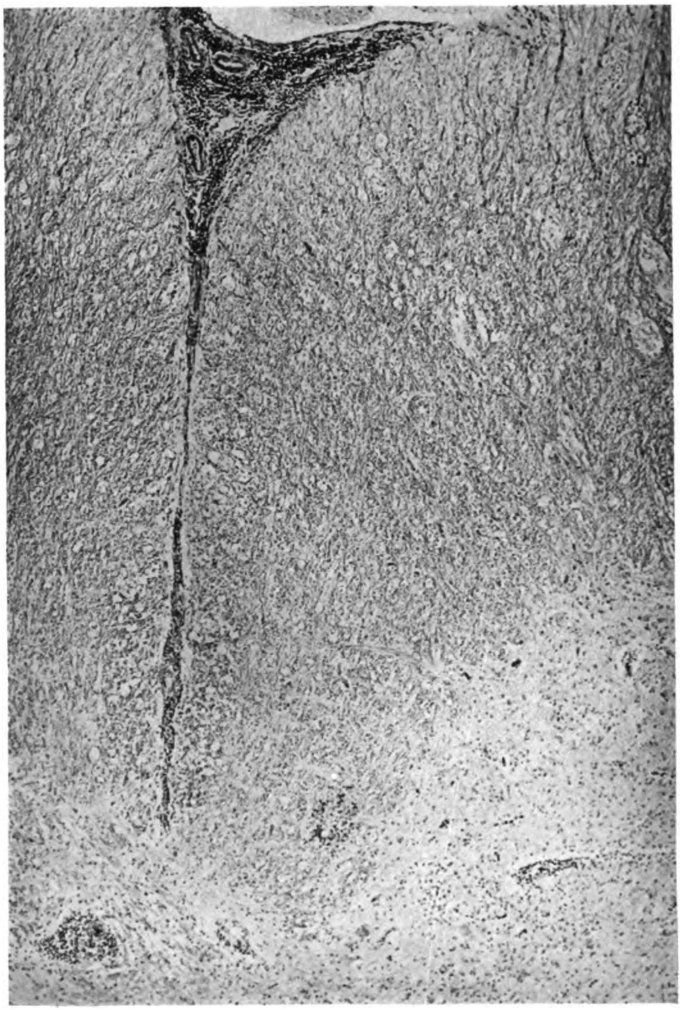
While the general opinion at present is to the effect that the intracerebral method of inoculation gives the most constant results, yet it is not the only mode of successful infection. It has been found possible occasionally to produce infection by injecting emulsions of the spinal cord, obtained from infected animals, into the blood, subcutis, peritoneum, trachea, and, after the administration of opium, into the stomach and intestine; but infection can be induced only with difficulty through these channels, and, as a rule, after the employment of relatively large quantities of the emulsion,

and, finally, with little certainty. On the other hand, when the infected material is brought into relationship with the nasal mucosa by spraying or pencilling, and when it is injected into a large peripheral nerve, the experimental disease frequently follows, even after the introduction of small quantities of the infected substance. It would appear that the most constant effects follow intracerebral inoculation, that intranasal inoculation is followed by nearly constant results (Flexner and Lewis), and that intraneural inoculation (Leiner and v. Wiesner) is followed by somewhat less uniform results.

It has been held that not every specimen of the spinal cord derived from a recent case of epidemic poliomyelitis in man is capable of producing infection in monkeys. Although up to the present time the number of inoculations made with human nervous tissue is not large, yet the consensus of opinion is to the effect that successful infection of monkeys occurs in about one-half of the attempts, but that once the infection of monkeys has been accomplished, no difficulty is encountered in continuing the transmission of the infection indefinitely to still other monkeys. As a matter of fact, it is probably possible to succeed in all instances in grafting the human virus upon monkeys, provided emulsions of the spinal cord are employed. In making the subsequent transfer of the virus, emulsions should again be employed until the human virus becomes adapted to the monkey, when filtrates may be substituted. Moreover, the original human strains of the virus not only infect monkeys less readily than do the modified or monkey strains, but the experimental disease produced by them is less severe and less fatal. Hence "races" of the poliomyelitic virus may be considered to occur naturally or to be produced by artificial methods of inoculation (Flexner and Clark).

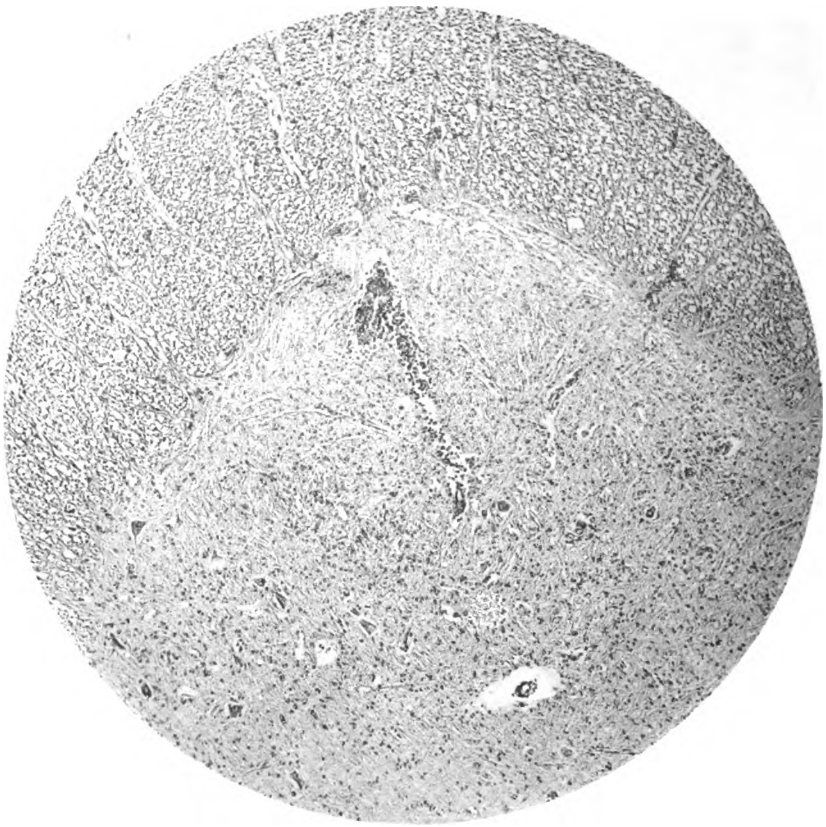
The question has been discussed as to whether it is possible to produce infection in other animals besides the monkey. The opinion has been that the monkey alone responds to the inoculation, and develops the symptoms and lesions of poliomyelitis in man. The claim has been made by Krause and Meinicke, and later by Lentz and Huntemüller, that young rabbits are susceptible to inoculation. It has, however, been admitted that the rabbits which succumb to the inoculations fail to show characteristic paralytic symptoms, as well as the specific lesions of the nervous system, although successive

Fig. 1.



Meningeal infiltration extending into the anterior horn by way of the blood-vessels in the anterior median fissure. (Low power.)

FIG. 2.



Perivascular and interstitial infiltration in the anterior horn of the spinal cord. The ganglion-cells are generally preserved. (Low power.)

series of rabbits could be inoculated successfully from each other. In a single instance, lesions of the spinal cord of an inoculated rabbit have been reported by Landsteiner and Levaditi. The test of the survival of the infectious agent causing poliomyelitis in the rabbit, carried out by inoculating monkeys from the rabbits, has failed except in one instance (Marks). Marks succeeded in propagating the agent of poliomyelitis through a series of six rabbits, and found that reimplantation of rabbit material derived from the sixth series upon monkeys led to typical paralysis associated with characteristic specific lesions in the spinal cord. The infective agent in this case was not derived directly from human beings, but from monkeys, in which it had been propagated for many generations.

That the agent of poliomyelitis can be propagated for a time in rabbits must be accepted as proved. It is established that these animals do not respond to its presence in a manner characteristic of poliomyelitis in man or in the monkey. It has been claimed that the rabbit can be infected by means of the blood, spinal fluid, spleen, and other organs derived from human cases of poliomyelitis. This claim is supported by convincing evidence, and is remarkable in view of the fact that the highly susceptible monkey has not been successfully infected with the blood or spinal fluid derived from acute human cases of poliomyelitis. Indeed, the agent causing poliomyelitis would appear to have an inconstant distribution in the body, aside from the central nervous system and nasopharynx. While it is present in the central nervous system in a condition capable of implantation in the monkey in practically all cases coming to autopsy, it has, up to the present time, been discovered several times in the mesenteric glands and even more often in the tonsils and nasal mucosa in fatal cases. Before drawing conclusions on this point, we must bear in mind that the number of experiments made with organs other than the nervous system is, up to the present time, small, and that when a larger number of attempts have been made to discover the agent elsewhere, to do which at present requires a large number of monkeys, we may have to alter our notions concerning its distribution throughout the body. Still, the number of inoculations made with the blood and spinal fluid is already great enough to establish the point that the agent in a form capable of transmitting the virus tends not to be present within them.

The distribution of the infectious agent in the inoculated monkey bears close relationship to the distribution observed in human beings. The agent is present regularly in the central nervous system, less frequently in the tonsils and nasopharyngeal mucosa, the mesenteric lymphatic glands, and some other lymphatic glands; it has not been found in the large internal organs.

III

What is the nature of the infectious agent that is responsible for epidemic poliomyelitis? It can be asserted positively that none of the bacteria which have been described from time to time as the cause of the disease ever act in this capacity, and it can be further stated that when they have not been introduced into cultures through contamination they have at most invaded the nervous system secondarily.

Searching examination of the lesions in the spinal cord, as they occur in human beings or in monkeys, by the most reliable morphological methods, has failed uniformly to disclose any micro-organism whatever, and yet it is known that the spinal cord contains the infectious agent, even in large amount, and by means of it infection can be produced in susceptible animals. We possess indubitable proof that the infectious agent is exceedingly minute, since it passes through the pores of several earthen filters—those of Chamberland, Berkefeld, Reichel, and Pukal. In other words, the infectious agent or virus belongs to the class of filterable or ultramicroscopic parasitic organisms, of which several are now known to cause serious diseases in man and animals. This infectious agent has not been seen even under the dark field microscope. It has not yet been cultivated artificially. It must possess a very high degree of infectivity and virulence, since very minute quantities of a filtrate prepared from the nervous system of an infected animal (from .1 to .001 C.c.) suffice to set up, almost without exception, the experimental disease in monkeys.

The infectious virus shows a considerable degree of resistance to physical agencies. It survives freezing for many weeks or months. When dried within the substance of the spinal cord, it survives for several weeks. It resists autolysis or softening of the nervous sys-

tem that takes place post mortem. When dried in an aqueous solution, free or nearly so from protein, it is destroyed or rapidly loses its virulence (Leiner and v. Wiesner). In the moist condition, it is destroyed by a temperature of 50° C. in a few minutes. Hence it would appear that, while the infectious agent can survive in external nature, yet it is incapable of multiplying there, and needs to be protected by substances such as organic secretions, etc., that prevent rapid and complete drying.

The persistence of the infectious agent within the body of infected animals or man varies, but, excluding certain exceptional instances, would appear to be of relatively short duration. We possess very few and imperfect data concerning the persistence of the infectious agent in man, and more complete data on this question as regards the monkey. These data indicate, generally speaking, that it may disappear from the nervous system as early as eight or ten days after the onset of the paralysis, or may remain there as long as three or four weeks. Since the agent has been found in very few situations outside the central nervous system, even at the height of the paralysis, it is significant that it may persist in the mucous membrane of the nose and throat, including the tonsils, as long as it persists in the nervous system, and, further, in exceptional instances it survives in the monkey in the nasopharyngeal mucosa for several weeks or even several months after the acute stage of the disease has disappeared (Osgood and Lucas). This important fact indicates that in certain, perhaps rare, instances infected animals, and probably infected human beings, become chronic carriers of the infection, just as in other infectious diseases, such as typhoid fever, dysentery, malaria, etc., chronic microbe carriers arise.

IV

The clinical course of experimental poliomyelitis in monkeys reproduces the clinical course of spontaneous poliomyelitis in man. The inoculation of the infectious agent, or virus, into the brain or other part, produces no immediate effects. As soon as the effects of the anæsthetic disappear, the inoculated monkeys return to the normal condition, in which they remain for a variable period that is spoken of as the incubation period of the disease. The first abnor-

mal appearance is not necessarily paralysis of the muscles. In many instances certain less definite symptoms appear that may be spoken of as prodromal signs or symptoms that anticipate the onset of paralysis from six to forty-eight hours or even longer. These prodromata consist of nervousness and excitability, and a more or less general tremor of the head, face, and limbs. Experience and close observation lead to considerable skill in the detection of the prodromal symptoms from which paralysis may be predicted. In not a few instances the monkeys fall suddenly ill and die without paralysis having occurred at all, or at least without its having been noted. In these cases marked lesions have, as a rule, been discovered in the medulla along with lesions in the spinal cord and sometimes of the brain.

The incubation period has shown considerable fluctuation, and has been as short as three days and as long as thirty-three days (Flexner and Lewis). At the present time a virus, which has passed through several scores of monkeys, is acting with uniformity, and the incubation period varies only a day or two and is from five to six days. This period can be lengthened by a day or two by inoculating a minute dose of the virus.

The paralysis affects different regions, as it does in man. The lower extremities are more frequently affected than the upper, but the muscles of the face and of the neck are often paralyzed, while the muscles of respiration and certain of the muscles innervated from the cerebrum also become involved. Various combinations occur, such as paralysis of one leg and one arm, legs and face, arms and face, extremities and bulb or cerebrum, etc. The onset of paralysis tends to be sudden and to affect any of the larger groups of muscles, after which the rule is an extension to still other muscular groups, or to the bulb or cerebrum. The cerebral involvement has led chiefly to paralysis of the facial and hypoglossal nerves, usually on one side, with the corresponding characteristic asymmetrical appearances of the face and tongue.

The paralysis, when developed, is of the flaccid variety, but in some instances a spastic condition, producing contraction of the limbs or retraction of the head, has developed, simulating the contractions of acute meningitis. This condition corresponds to the so-called meningeal type of epidemic poliomyelitis. Certain rare monkeys

Fig. 3.

Perivascular infiltration in the medulla oblongata. (Low power.)

Fig. 4.

Combined perivascular and interstitial infiltration of the medulla oblongata. (Low power.)

pass through the prodromal symptoms without developing frank paralysis. In them the disease fails to develop, and aborts. That these animals have actually developed an imperfect and abortive form of the disease is capable of demonstration through certain immunity reactions to be referred to later.

The paralyses relate, of course, to disturbances of innervation of the voluntary muscles. They are so obvious when they are present as to dominate the symptoms of the disease, but sensory disturbances also occur, although their recognition is less satisfactory. Conditions of anæsthesia, and particularly of hyperæsthesia, have both been noted. Hence it follows that in all essential symptoms the experimental disease in the monkey corresponds with the spontaneous disease in man. In two details marked differences occur: first, the affected animals tend not to show febrile disturbances; and, second, the experimental disease is a much more fatal affection than the spontaneous disease in man. The termination of the experimental disease may be by recovery, by partial recovery, with residual paralysis, or by death. The proportion of instances of complete recovery is small; that with recovery with residual paralysis is larger, while, once the virus has become adapted, termination by death, even after the most careful nursing, is the rule. The mortality of the experimental disease may be greater than 90 per cent. of the paralyzed animals. And this high mortality does not seem to be dependent on the mode of inoculation. The immediate cause of death is either an ascending paralysis which comes to affect the muscles of respiration, or a condition of impaired nutrition and exhaustion.

To resume: The clinical course of experimental poliomyelitis in the monkey consists not of a single set of symptoms, but of manifold symptoms, through which several types of the disease are produced, corresponding to the types described for the spontaneous disease in man, and including the abortive, meningeal, cerebral, and, most frequently, the spinal form of the affection.

V

It has been stated that the histologic changes characteristic of epidemic poliomyelitis agree in essential points in affected human beings and monkeys. This being true, it follows that as the disease

can be studied at any and all stages in monkeys, which can be sacrificed to afford these stages, the pathogenesis of the lesions should be capable of being worked out most satisfactorily in these animals. Indeed, the pathogenesis of the affection has been placed on a firm foundation through the histologic studies of the experimental disease, to which should be added that they have served to confirm the conception of the pathogenesis expressed by Wickman and by Harbitz and Scheel from their study of human specimens.

The developed histologic lesions consist of necrosis and degeneration of the ganglionic nerve-cells, and especially of the motor cells in the anterior horns of the spinal cord, and less constantly of the nerve-cells of the medulla, cerebrum, and pons. The lesions are not confined to the nerve-cells, but affect the ground substance in which they lie, which shows œdema, hemorrhage, and leucocytic infiltration. But the lesions affect still other structures; namely, the sheaths of the blood-vessels, both arteries and veins, corresponding to the injured nervous tissue, and finally also the leptomeninges, which show a degree of cellular invasion. In order to understand the pathogenesis, it becomes necessary to unravel this series of lesions and to separate those which are primary from those which are secondary in character. (Figs. 1 to 7.)

The essential point at issue is whether the virus of poliomyelitis attacks primarily the parenchymatous elements—namely, the nerve-cells, injury to which tends to be followed by cellular infiltration and proliferation in the ground substance and about the vessels and meninges—or whether the virus develops within the interstices of the meninges, and especially in the spaces about the vessels, where it produces an interstitial accumulation of cells, of the nature of white corpuscles, that constitute the primary lesion from which the nerve-cell lesions result. The view expressed by Wickman in his latest publication is to the effect that the virus produces both interstitial and parenchymatous lesions, the former being more common than the latter, and that the main parenchymatous lesions are secondary to the interstitial ones. This view has been supported in the main by the study of the experimental disease in monkeys. However, Leiner and v. Wiesner have championed the view that the virus attacks primarily the parenchyma of the nervous system, and that the interstitial changes are invariably secondary. Those who hold

the interstitial changes to be the essential primary ones view the parenchymatous lesions as being the result in large part of the vascular impairment brought about by the accumulation of white corpuscles, chiefly of the nature of lymphocytes, in their sheaths, through which the circulation is impeded, and in the adjacent ground substances. The impediment to the blood and lymph circulation in turn produces functional and structural changes in the nerve-cells that in many cases lead to degeneration and even to necrosis, the necrotic cells becoming later invaded by the leucocytes that compose the so-called neurophages. As a matter of fact, the histologic study of the spinal cord in the pre-paralytic stages of the experimental disease in monkeys at the moment that the prodromal symptoms have become clearly apparent brings out the important fact that the interstitial changes are well advanced, while the nerve-cells present essentially a normal appearance (Flexner and Clark).

In the effort to explain the pathogenesis, the constant occurrence and significance of lesions of the intervertebral ganglia have been neglected. Lesions of these ganglia are as common and constant in the monkey as the lesions of the anterior gray matter. Parenthetically it may be added that lesions of the ganglia also occur in human cases of the disease, and probably as constantly as in the experimental affection. Now the lesions of the ganglia consist of an interstitial lymphocytic infiltration with or without concomitant degeneration and necrosis of the nerve-cells. The necrotic nerve-cells, when present, are invaded by neurophages in the same manner as the corresponding motor nerve-cells of the anterior horns. What is significant is that the lesions of the ganglionic cells proceed from the periphery towards the centre, which is also precisely the order of procession of the interstitial cellular invasion. It is a simple matter to follow from the enveloping meninges the cellular infiltration into the ganglia along the main lines of supporting connective tissue and the vascular network. These considerations dispose of the conception that epidemic poliomyelitis is a systemic disease affecting primarily the motor nerve-cells, and they support the contention that the virus acts chiefly upon the interstitial elements of the meninges, causing a cellular, chiefly lymphocytic, accumulation, most abundant about the blood-vessels, through which various parenchymatous cells, including both motor and sensory nerve-cells and

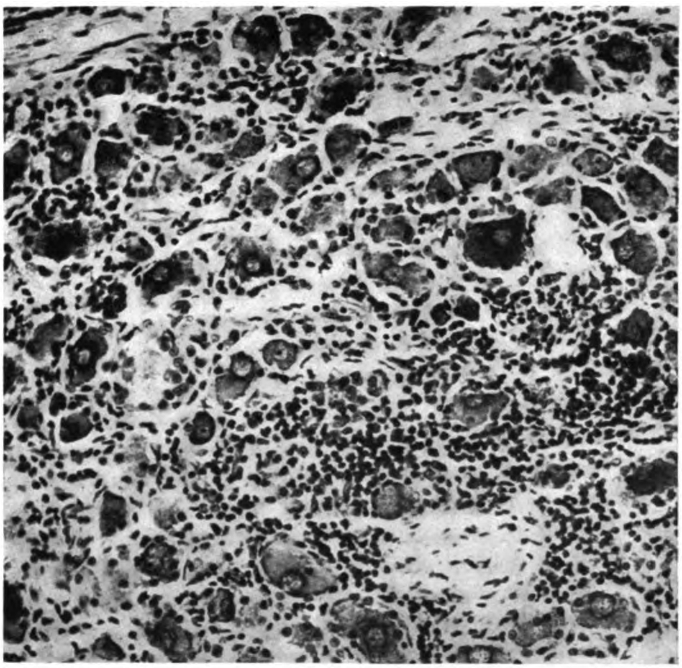
their surrounding ground substance, become injured or destroyed. The œdema and hemorrhages and leucocytic accumulations are incidental phenomena.

The pathogenesis as just expressed is in accord with the prevailing conception regarding the manner of distribution of the infectious agent of poliomyelitis. Two possibilities of distribution exist; namely, through the blood and through the lymph. The manner of localization of the lesions in the central nervous system does not support the notion of a hæmatogenous transmission of the virus, while it does support the notion of lymphogenous transmission, which is also supported by experimental results. Clinical observation of the disease among human beings and among monkeys has shown that the affection tends to be focalized chiefly in the lumbar or cervical region of the spinal cord, to which it may be confined, or from which extension may take place in an upward or downward direction. The ascending extension is the more common, in the course of which successive segments of the spinal cord become affected, the connections between which are lymphogenous and not hæmatogenous. Moreover, the experimental disease in monkeys can be produced by inoculating the peripheral nerves, in which case the paralyses developing correspond to the site of inoculation. When the inoculation is made into the nerves of the lower extremity, the paralyses first appear in the legs; when into the nerves of the upper extremity, in the arms. It has already been stated that inoculation of the nasal mucosa with the virus leads to the development of paralysis, also tending to be superior in distribution. Finally, the inoculation of the virus into the blood is a very uncertain method of producing infection, while the injection of the virus into lymph-spaces, as in intracerebral, intraneural, and intranasal inoculation, is a more certain and almost constant mode of causing infection.

VI

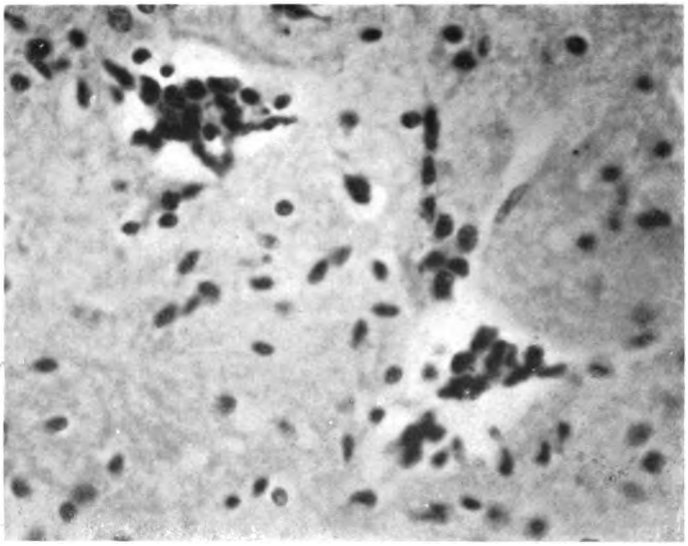
The mode of infection in the spontaneous disease in man is still a matter of speculation. Certain points seem established as regards the manner of dissemination of the infectious agent or virus of the disease. To human beings, both actively infected and healthy, has been ascribed the part of intermediaries between the stricken and

FIG. 5.



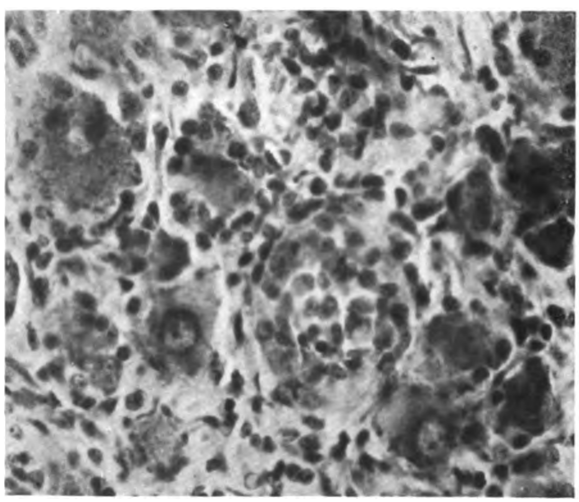
Cellular infiltration in an intervertebral ganglion. (High power.)

Fig. 6.



Neurophagic destruction of nerve-cells in the anterior horn of the spinal cord. (High power.)

Fig. 7.



Neurophagic destruction of a nerve-cell in an intravertebral ganglion. (High power.)

the well who are to develop the disease. According to this view, we are asked to admit the existence both of active and passive carriers of the infection, although it is acknowledged that we are still imperfectly informed of the manner in which the infectious agent enters the human body in order to produce infection. Such facts bearing on this point as are available have been derived first from experiment, after which confirmation has been secured from the study of human material.

We have seen that the intracerebral mode of infection in monkeys is not the only successful one, but that the virus may be introduced successfully through other channels, and particularly by means of the nasopharyngeal mucous surfaces and the large nerves. We can form no conception of a mechanism by which the virus may be introduced in nature into the central nervous system through inoculation into the large nerves, while we can readily imagine that infection of the nasopharynx could occur under ordinary conditions in nature. It has already been stated that the virus of poliomyelitis passes from the central nervous system into the mucosa of the nose and throat, and it has been shown recently that a similar excretion takes place in cases of human poliomyelitis (Landsteiner, Levaditi, and Pastia, Flexner and Clark). The question now arises: Does this membrane serve a double function, as it were, in respect to the virus of poliomyelitis; that is, may this membrane serve for the entrance of the virus into the body, as well as for its exit from the body? It may readily be shown that the virus, when sprayed into the nose, or after pencilling or application to the intact or scarified membrane, passes with considerable readiness, apparently, from the central nervous system into the nasal mucous membrane. By employing a suitable method, the virus has been detected in the tonsils or nasal mucosa of several successive cases of epidemic poliomyelitis (Flexner and Clark).

Hence there is foundation for the view that the nasal mucosa may serve not only as the portal of infection, but also as the path of elimination of the virus into external nature, since some elimination must occur in order that the virus be maintained alive and transmissible. It is well known that direct connections exist between the meninges and the nasal mucosa by way of the lymphatics, which

pass with the filaments of the olfactory nerve through the cribriform plate. The view has been expressed that the virus first becomes implanted within the leptomeninges, and this primary location of the virus is what would be especially favored by this mode of entrance of the virus into the nervous system. The question as to whether the virus can be directly implanted in the leptomeninges can be answered in the affirmative; an active virus introduced by lumbar puncture into the meninges leads sometimes to infection and paralysis. The infection in this manner is not readily accomplished, possibly because the virus quickly escapes from the membranes by way of the veins. From the nasal membrane as the site of primary development, the virus would be so located as to produce successive inoculations of the meninges.

This view of the mode of infection is supported by an analogy. In point of distribution, epidemic poliomyelitis resembles epidemic cerebrospinal meningitis so closely that the two diseases have often been confused. The chief and striking difference in this respect relates to the seasonal prevalence, which for epidemic poliomyelitis is midsummer, and for epidemic meningitis late winter or early spring. The two diseases, moreover, attack by preference infants and young children, although not sparing older children and adults, and in about the same ratio. In the majority of instances a single case appears in a family or home, but often two cases, and less often three or more cases, appear. The relation between the group cases in a locality has, in respect to both diseases, been ascribed to the intermediate human carrier of the infection. Now it is held that *Diplococcus intracellularis,* the bacterial cause of epidemic meningitis, passes into the cerebrospinal membranes by way of the lymphatic connection existing between them and the nasopharyngeal mucous membrane, and it has been shown that when in monkeys cultures of the diplococcus are injected into the meninges by lumbar puncture they migrate into this mucous membrane. The agreement, therefore, in these respects between the two diseases is striking.

Although much stress has been laid upon the human agency in transmitting infection, it should be stated that in no instance has spontaneous infection through contact been observed in the monkey. This is, however, precisely what would be expected in view of the difficulties attending the infection of monkeys by any of the external

routes of entrance into the body of the virus of the disease. The monkey obviously possesses adequate mechanism of external defence, and it is only after these have been circumvented and the virus implanted by artificial means upon the central nervous system or parts in direct communication with it that infection is induced.

VII

Studies of the manner of travel of, and the route taken by, epidemic poliomyelitis, in thinly-populated districts especially, have failed in not a few instances in supporting fully the idea of the human agency in the transmission of the infection. Studies of this kind cannot be made satisfactorily in cities or even in towns, for the reason that the contact with persons is too frequent and promiscuous to permit of accurate tracing. Owing to this discrepancy, some other agencies have been suggested in the effort to account for the transmission of the infection over wide areas, and the chief ones of this character have been domestic animals and insects. Paralytic diseases among domestic animals are known, and are not infrequent. They occur among dogs, horses, and fowls, but it has not been found possible thus far to correlate the paralytic diseases of the lower animals and those of man. Perhaps the most frequently observed coincidental occurrence of paralytic diseases has been between hens and human beings. However, it appears that the paralysis of fowls is caused not by lesions of the central nervous system, but of the peripheral nerves, and is due, therefore, to a peripheral neuritis. It has not been found possible to transmit by direct inoculation the paralytic disease from chicken to chicken, or from chicken to monkey, or from paralytic monkey to chicken, but it has been found possible to develop the paralysis in the laboratory by supplying fowls with an improper form of food (Flexner and Clark); and the experimental studies on beri-beri have already shown that fowls readily develop paralyses when deprived of certain necessary elements of food. It has also proved impossible to transfer the paralytic affection of dogs from one individual to another by direct inoculation, or from dog to monkey, or from paralyzed monkey to dog (Flexner and Lewis). These facts do not, of course, exclude the possibility that a reservoir for the virus may exist among domesticated animals that do not even

respond to its presence by developing paralysis or other conditions which could be recognized as resembling poliomyelitis in man. The manner of the action of the virus of poliomyelitis in rabbits provides an illustration which shows how necessary it is to avoid general deductions in this field.

Insect contamination with the virus would serve, were it proved not only to be an experimental possibility but to occur in nature, to clear away any present apparent discrepancies in the epidemiology of the disease. In this connection it should be stated that not only does epidemic poliomyelitis spread over a wide territory, but its spread is not promiscuous, but along the routes of human travel. Therefore, insects that seek human habitations and routes of travel, that possess the power to migrate over a considerable territory, that affect all classes of society, that abound during the period of greatest prevalence of the disease, and that do not wholly disappear at any season should be the first to come under suspicion. In view of the fact that many, if not all, of these conditions are fulfilled by the common house-fly, laboratory-bred flies have been subjected to contaminating experiments with the virus of poliomyelitis, from which it appears that they are capable of harboring the virus on their bodies in a living and infectious state for at least forty-eight hours; and it has, moreover, developed that the virus also survives within the viscera of the insects for some time. Whether these facts, established by experiment, have any application to the spontaneous affection in human beings remains for the present an open question.

VIII

It has been shown by experiment that recovery from epidemic poliomyelitis is effected by means of immunity principles that appear and persist for a long time—perhaps for years—within the blood. The blood-serum of normal persons and monkeys appears to be devoid of neutralizing power for the virus of poliomyelitis. The blood-serum obtained from human beings or monkeys that have passed through an attack of poliomyelitis, whether spontaneous or experimental, or of slight or severe grade, comes to possess neutralizing principles for the virus. The existence of these principles can be shown by mixing *in vitro* an effective dose of the virus with the

serum, incubating it for a short time, and injecting the mixture intracerebrally into the monkey, in which case paralysis fails to develop. By tests similar to this, the occurrence of abortive forms of poliomyelitis has been proved, both for human beings and for monkeys.

Serum containing the immunity principles, derived either from human beings or monkeys, has been successfully employed by subdural injection to prevent the development of paralysis in monkeys following the inoculation of the virus (Flexner and Lewis). More recently still the fact has been ascertained that several larger domestic animals, including the horse, sheep, goat, and pig, can be made to develop the immunity principles in their blood by subjecting them to injection of the spinal cord and brain of monkeys containing the living virus (Flexner and Clark). But these sera do not hold out at present any great hope of beneficial application in the treatment of developed poliomyelitis in human beings, for the reason that they are relatively weak in the immunity principles.

Because of the presence of these immunity principles it is probable that human beings as well as monkeys that have recovered from an undoubted infection with the virus of poliomyelitis remain protected against subsequent infection. It has been possible to test this point experimentally upon monkeys, as regards which there is general agreement that an attack of poliomyelitis tends to protect against subsequent inoculation with the virus. In rare instances monkeys appear not to be thus protected, and to be subject to reinoculation after an interval of time. The question is still an open one whether in man a second attack is ever suffered. Thus far no clear instance seems to have been observed, and what appear to have been rare instances of this condition are probably better explained on the supposition that they represent late relapses of the original infection.

Finally, it may be added that effective treatment of poliomyelitis may possibly be secured through the employment of drugs. Since the drugs employed must come to act in the region of the central nervous system, choice is restricted to such as possess antiseptic properties, and can yet be applied to that sensitive part. We possess few drugs that exhibit the property of internal antisepsis so called, or, in other words, such as are capable of exerting their antiseptic properties in the interior of the body in the presence of the

proteins of the blood and tissues. Just here account should again be taken of the pathogenesis of epidemic poliomyelitis, since it is on it that the selection of the drug and the manner of its administration may come to be based. Since the evidence at hand points to the interstices of the tissues as being the location of the primary lesion of the disease, it is probable that antiseptic drugs having a special power to destroy the virus of poliomyelitis, and of very low toxicity, that can be made to exert their principal action within the meninges, may be discoverable. Indeed, we already possess in hexamethylenamine (urotropine) a drug which fulfils certain of these conditions. It is an internal antiseptic of some power, and is eliminated in some degree from the general circulation into the subdural space (Cushing and Crowe). On empirical grounds, the drug has already been administered in cases of epidemic poliomyelitis, but whether with any definite effect is not known. Administered to monkeys prior to, or coincident with, inoculation, and repeated daily afterwards, hexamethylenamine is capable in some instances of preventing paralysis, and in others of lengthening materially the incubation period of the disease (Flexner and Clark). In spite of the fact that its powers in this direction are limited, the field which it opens to investigation is a large and important one.

IX

The present and obvious course open to physicians is to recognize the infectious and essentially contagious character of epidemic poliomyelitis, and, in the absence of specific and effective modes of treatment, to attempt the limitation of the disease by prevention. With our present knowledge, the nasopharynx should be regarded with particular suspicion as probably always harboring the virus during the acute period of the disease and as being the site of entrance of the virus into the central nervous system. The virus, enclosed in mucus, is highly resistant to drying and other injurious influences, and can readily be carried from place to place or disseminated as dust. Not only does it appear that the acutely ill patient, but also his associates and attendants, are capable of transferring the infection, probably because of the unusual degree of resistance displayed by the virus.

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IMPORTANT FACTORS IN REDUCING THE HIGH DEATH-RATE IN DIPHTHERIA *

BY EBEN C. HILL, M.D.
UNITED STATES ARMY

WHILE a few sections of the United States show very encouraging results in the recognition and treatment of diphtheria, the record of this country taken as a whole is far below what we have a right to expect. That there should be such a markedly higher ratio of death from this disease in New York City and certain of our States than in Paris warrants careful investigation. A comparison between the death-rate of the largest city of our country and that of the capital of France shows that New York City has five times as many deaths from diphtheria as Paris. We find also that in the United States this ratio varies from 35.4 to 11.3 as found in different States.

Rate per 100,000 of Mortality from Diphtheria during 1908.

Paris	7.0 [1]
New York City	37.1
Washington (State)	35.4
Rhode Island	29.5
New York State	28.9
Colorado	28.4
New Hampshire	24.3
California	22.4
Vermont (lowest reported rate)	11.3 [2,3]

In seeking the causes and remedies for this curious condition, certain pertinent questions are presented. Is diphtheria more virulent in the United States than in France? So far no satisfactory proof has ever been introduced to show that such is the case. Assuming, however, that this country has a more virulent strain of bacilli, and that Americans are more susceptible to the disease, how do we account for the fact that two States, New Hampshire and Vermont, of similar environment, climate, temperature, and population, show a death-rate in one State of 24.3 and of only 11.3 in the other?

* Published by authority of the Surgeon-General, United States Army.

Is American antitoxin inferior in quality? Here again a negative answer must be given, because if there be any difference in quality, the advantage is in favor of the concentrated, refined, and carefully produced American serum. Is antitoxin more easily procured in Paris? Practically all health boards in the United States are prepared to supply at any time, on the shortest possible notice, any desired amount of antitoxin.

Then why this high death-rate? Briefly, the causes may be summarized as: late diagnosis; late and inadequate prophylaxis; inadequate use of antitoxin based on lack of faith in its curative properties and fear of the serum; and, finally, neglected or missed cases which become "carriers" and cause epidemics.

In discussing the authority for these conclusions, certain statistics will be presented. At the same time it may be permissible to review the recommendations of those clinicians and epidemiologists who have studied the necessary means which must be employed before there is any marked reduction in this high death-rate.

DIAGNOSIS

The all-too-prevalent idea that diphtheria is a clearly cut, easily diagnosed disease has occasioned many serious epidemics. All physicians immediately suspect the classical cases. In those of less experience this is largely due to that excellent but limited definition which describes the disease as "an acute, contagious disease, excited by the Klebs-Löffler bacillus, and characterized by moderate fever, glandular enlargement, great prostration, anæmia, and the formation of a false membrane upon certain mucous membranes, especially of the throat and adjacent parts." Together with this definition must be included those old favorites, "the false membrane" of "grayish color," very "tenacious" in character, "difficult" to remove, and "leaving a bleeding surface." Without any one or more of these objective symptoms, the case is not entitled to any more serious diagnosis than a "cold in the head" or tonsillitis, so far as bacteriological examinations or prophylactic treatment are concerned. Those vitally interested in epidemiology, as, for example, Chapin and Doty, are each year laying more stress on the dangers arising from undiagnosed atypical cases. In diphtheria these atypical forms present hardly any symptoms of the classical grouping. The mild, slowly-developing nasal, laryngeal, pharyngeal,

and aural manifestations of the mild or atypical types of this disease may be so slightly in evidence that neither physician nor parents are warned of the presence of a contagious and dangerous disease. The child may be merely fretful, gradually become weaker and more irritable, with no very evident signs of disease aside from a slight nasal discharge or some seemingly minor but persistent throat or ear inflammation. There may be a rather rapid pulse, perhaps a trifle weak and irregular. The breathing may be somewhat more rapid and the temperature for a week or ten days may rise to 100° F. during the evening. There is nothing very alarming in these symptoms except the increasing weakness and loss of appetite.

Smears or cultures taken from deep down in the throat or from far back in the posterior nares would reveal the presence of diphtheria bacilli, but since the majority of the text-books describe only the most common types of the disease and lay such great stress on the "membrane," no such diagnostic measures are taken. Later, when the child has become terribly weakened by the toxin of the disease, and after the infection has been transmitted to others, the laboratory may be appealed to. Practically all State laboratories have arranged for carrying on this culture diagnosis. There is no charge. Yet the health boards report that specimens for diagnosis are most frequently sent in only after the clinical symptoms have clearly proved the presence of diphtheria. This reduces the efficiency of the boards to the position of verification. The value of early laboratory evidence in all suspicious or unexplained laryngeal, nasal, pharyngeal, or aural conditions is well expressed by McCollom: "The importance of a bacteriological examination in all cases of suspicious sore throat cannot be overestimated. Much as has been said about the inaccuracy of cultural diagnosis, and while mistakes may be made in the laboratory, the chances of error are very much less in cultural diagnosis than in clinical." One great source of error is carelessness in taking the culture. The swab is simply put into the mouth and does not come in contact with the diseased parts. Dr. Dixon, State Commissioner of Health of Pennsylvania, calls attention in his yearly report to this delay in having early cultures made, and quite strongly emphasizes the uselessness of late examinations and the consequent danger to the patient and the public. He cites as an example an all-too-common occurrence. Dr. M. F. Cawley, C. M. I., after investigating an epidemic in an

asylum of thirty-five inmates in Lehigh County, Pennsylvania, reported that "the attending physician had not diagnosed the earliest cases of diphtheria, and it was only when the child of the superintendent sickened and Dr. S., of Bethlehem, was called that the disease was properly diagnosed." Here we have an example of a late diagnosis which resulted in endangering the lives of some thirty-five inmates, mostly children, and all residing in close contact.

In Pennsylvania the results of delayed diagnosis and treatment are given by Dr. Dixon. He shows that the ratio of death among those treated was as follows: 6.53 for those diagnosed and treated on the first day, 7.92 for second day, 14.44 for third day, 22.83 for fourth day, and 28.15 for those who received antitoxin as late as the fifth day.

LATE PROPHYLAXIS AND PROPHYLACTIC DOSAGE

Late prophylaxis is dependent upon tardy diagnosis. According to Dr. Dixon, this delay in quarantine and immunization is responsible for many serious epidemics. "If physicians would follow instructions in regard to immunizing all those in the immediate vicinity of the patient at once, it would go far toward stopping the spread of the disease, if not altogether eliminating the chances of an epidemic." His report for the year 1908 shows that 3920 patients received prophylactic treatment, among whom only 45 contracted the disease. Unfortunately no record is given as to the time when the immunizing treatment was administered, and it is quite possible that early prophylaxis would have prevented a certain number of infections amongst these forty-five.

At Madison Barracks, N. Y., about one hundred and fifty immunizations were given during a recent epidemic. The dose was 1000 units, regardless of age or physical condition. None of those so protected acquired the disease. Concerning the amount of antitoxin demanded for prophylaxis, there is at present but little difference of opinion. When first introduced, there was an experimental period of small dosage ranging from 100 to 200 units. Now, however, these amounts have been increased, and a prophylactic dose of 1000 units is almost universally recommended. For children, Holt adopts a scale depending on age: for one month of age, 100 units; ten to twelve years, 700 units; and for fourteen years and

over, 1000 units.[4] The Children's Hospital of Boston, which has been most successful in the treatment of diphtheria, uses 750 units for children under two years of age and 1500 units for all others.

INADEQUATE TREATMENT

Unquestionably the high mortality in diphtheria is due to a great extent to insufficient use of antitoxin in serious types of this disease. Fear of using this serum is undoubtedly responsible for the small doses given by a large number of physicians.

Quite recently an American medical journal reported the sudden death of a child immediately following a prophylactic injection of 1000 units. This report will find a very secure abiding-place in the minds of those physicians who have not as yet abandoned the ancient theories as to the injurious action of this serum on the heart, kidneys, and general nervous system. Autopsy showed that the child in question had status lymphaticus. Suppose it had been necessary that such a patient submit to an operation under an anæsthetic and death had ensued. Would anæsthetics be abandoned, or would they be used in such small amounts that the patient would be only partially unconscious? Practically all drugs are poisonous, and their use would be discontinued if idiosyncrasy or personal susceptibility were considered. A few grains of bromide, minute doses of morphine, and insignificant amounts of other drugs have been reported as causing isolated cases of death. Should these drugs be abandoned or used only in such small dosages that they would be valueless?

The fear of using antitoxin has been bequeathed to us since the days of its first adoption by French physicians. The few cases of death which have been chronicled as due to diphtheria serum can be more scientifically and truthfully considered as "paralysis of the heart or nervous system" due not to the antitoxin but to the large amounts of toxin present in the patient and not sufficiently controlled by antitoxin. That antitoxin was not responsible for these deaths is easily proved. Long before the days of antitoxin, Flint, in his "Practice of Medicine" (published in 1866), mentions heart failure in fatal diphtheria. It is impossible to attribute deaths at that period to antitoxin. McCollom definitely and conclusively states that from a practical standpoint it has been demonstrated beyond all possibility of doubt that the heart is in no way

affected by this serum.[5] White and Smith, after a chemical study of 946 cases, unhesitatingly assert that "antitoxin does not affect the heart unfavorably, but, on the other hand, its early use prevents the appearance of grave heart complications."[6]

The oft-repeated theory that this serum in large doses produces a serious albuminuria with a consequent fatal nephritis is likewise without foundation. For here again we note that albuminuria and frequently fatal degenerative changes in the kidneys during diphtheria were reported many years before the advent of antitoxin.

Recently there have been suggestions of a certain danger from anaphylaxis. Major Frederick F. Russell, Medical Corps, United States Army, who has had a most extensive opportunity to study these supposed effects both experimentally and clinically, has assured me that this fear is based on animal experimentation and is not borne out in the treatment of human beings. Aside from these facts, however, statistics show that large doses of antitoxin result in recovery without renal or cardiac complications, while death in diphtheria following the use of small and insufficient amounts of serum is frequent. Dr. Porter in his annual statement for New York State reports that the average amount of antitoxin given to those who died from diphtheria in that State was less than 12,000 units. On the other hand, State Commissioner Dixon, of Pennsylvania, records dosages of 52,000, 57,000, 63,000, 68,000 and 117,000 units. Each case recovered, and although presumably serious cases, there were no fatal "renal or cardiac complications."

During the past two years I have closely followed the advice of McCollom and Holt in administering antitoxin to twenty-four consecutive cases of diphtheria, six of which were especially virulent forms of the disease and presented alarmingly dangerous symptoms. The amounts of antitoxin varied from 5000 units in mild cases up to 59,000 units for patients showing very toxic symptoms or serious laryngeal involvement. Yet even in the administration of extremely large doses to children under five years of age, I have noted no ill effects which could be attributed to antitoxin, and so far I have had no death from this disease. In consulting the various authorities as to the amounts of antitoxin needed and the frequency of administration, the advice is surprisingly at variance. Naturally we would not expect the same exactitude in dosage as is found in well-known drugs of many years' usage. But after eighteen

years one would reasonably suppose that there would be more uniformity in the amounts advocated. Many physicians recommend only 2000 units every twelve hours; others advise 5000 units at twelve- to twenty-four-hour intervals. A few, however, and these are the physicians of widest experience with the treatment of this disease, agree that the danger from diphtheria is greatly lessened by large amounts of antitoxin given at frequent intervals.

Since, as McCollom explains, there is no way of estimating the quantity of toxin generated in any one case of diphtheria, and since this serum has been definitely shown to be harmless, the only rational course of treatment should be to administer this curative agent until the characteristic effect is produced, viz., "the shrivelling of the membrane, the diminution of the nasal discharge, the correction of the fetid odor, and a general improvement in the condition of the patient." Large doses, he asserts, are not required in the majority of the cases, and ordinarily 4000 to 6000 units are sufficient to produce this characteristic effect. But in every case we must administer the antitoxin until all untoward symptoms disappear, no matter whether we use 5000, 50,000, or 100,000 units. Concerning the intervals between doses, McCollom states that in cases with an extensive membrane or very toxic symptoms 8000 or 10,000 units should be given every four to six hours until there is a decided amelioration of the symptoms. Small doses, he contends, are of little or no avail in the treatment of grave types of this disease, and in order to obtain the best results the serum must be heroically given.

In discussing this frequency of administration and the seemingly high dosage, he explains that in the early days of antitoxin the doses were too small because of the legitimate fear of doing harm, but that experience has proved that there are no ill effects from the use of large amounts of this serum, and consequently the dosage has been materially increased. The result has been a corresponding decrease in the mortality from this disease. No case, he says, in an acute stage should be considered hopeless. When one sees a patient with membrane covering the tonsils and uvula, profuse sanious discharge from the nose, spots of ecchymosis on the body and extremities, cold, clammy hands and feet, a feeble pulse, and the nauseous odor of diphtheria, and finds that after the administration of 10,000 units of antitoxin in two doses the condition

of the patient improves slightly, that after 10,000 units more have been given there is a marked abatement in the severity of the symptoms, that when an additional 10,000 units have been given the patient is apparently out of danger, and eventually recovers, one must, he states, believe in the curative power of antitoxin. When one sees a patient in whom the intubation tube has been repeatedly clogged, when the hopeless condition of the patient changes for the better after the administration of 50,000 units, one cannot help but be convinced of the importance of giving large doses of antitoxin in the very severe and apparently hopeless cases.[7] Holt, likewise, has very decided views on the use of antitoxin in diphtheria. His wide experience with this disease renders his advice of especial value. "Convinced now of the essential harmlessness of the serum, the tendency everywhere has been to use larger and larger doses, a practice which has been fully justified by the results obtained."

For a child over two years of age an initial dose for a severe attack, including all laryngeal cases, should be not less than 7000 or 8000 units, repeated in from four to six hours if no improvement is seen. Children under two years should receive from 5000 to 7000 units. Cases of exceptional severity in older children should receive from 10,000 to 15,000 units, to be repeated in from six to eight hours if the progress of the illness is unfavorable. Mild cases should receive from 3000 to 5000 units as an initial dose, a second rarely being required. In cases receiving antitoxin late, even though the symptoms may not seem particularly severe, the dose should be increased in proportion to the length of the illness, *i.e.*, if three days ill, three times the ordinary dose should be given. From this advice it would appear that in a very severe case of three days' duration the patient would receive from 30,000 to 45,000 units in a very short time. In this connection it may be well to recall Dr. Porter's statement that the average amount of antitoxin given to those who died from diphtheria in New York State was less than 12,000 units.

That a rational use of antitoxin, as advocated by McCollom, does materially reduce the mortality in diphtheria is shown by the results obtained at the Boston City Hospital and South Department, Boston. In 1893 no antitoxin was used and the death-rate was between 45 and 50. In 1895 antitoxin was adopted and the amounts

used were increased year by year, with a corresponding decrease in the death-rate, until in 1904 the ratio was only about 7. This indicates what may be reasonably expected from a rational and scientific use of antitoxin.

NEGLECTED, MISSED CASES AND ATYPICAL FORMS

The possibility of mild or atypical cases of diphtheria remaining undiagnosed has already been mentioned. Such patients are not isolated, no prophylaxis is instituted, and the infection is readily spread. These cases are of the ambulant and atypical variety, and are each year arousing greater interest. Jacobi as early as 1884 recognized the danger to the community from these cases. His words even now are well worth careful consideration: "The symptoms are often few. A little muscular pain and difficult deglutition are perhaps all that is complained of. Women will quietly bear it; men will go about their business. . . . There is as much diphtheria out of bed as in bed; nearly as much outdoors as indoors. Many a mild case is walking the streets for weeks without caring or thinking that some of his victims have been wept over before he was quite well himself. . . . Diphtheria is contagious. Severe forms may beget severe or mild forms. Mild cases may beget mild or severe cases."

Quite recently an epidemic of 18 cases, several of which were very serious, was traced directly to an assistant in a butcher shop who for three weeks or longer was excreting diphtheria bacilli from a purulent nasal discharge.[8] Yet this man was not sufficiently ill to be kept at home, and in the absence of any bacteriological examination he became a most dangerous carrier. The Surgeon-General, United States Army, reports an epidemic of thirteen cases which occurred at Fort Slocum, N. Y., during the latter part of August and September, 1910. A "carrier" was discovered to be directly responsible for this outbreak. Five cases of diphtheria occurring at the Presidio of San Francisco, California, were proved to have been infected by a "carrier."[9]

It is by no means infrequent to find that a child with an atypical form of this disease has remained at school or been allowed to be in close contact with other children. In the recent literature is found just such an example.[8] This child, although suffering from

a slight nasal discharge, had played with other children two or three weeks before the sudden symptoms of toxæmia resulted in the diagnosis of the serious disease present. An epidemic followed and the child who occasioned it nearly died.

From a purely economic standpoint this epidemic was of particular interest. An early diagnosis, with isolation of suspects and carriers and the use of a small amount of antitoxin for prophylaxis and treatment of the early stages of the disease in the child, would have prevented the quarantining of several families and the subsequent use of about 400,000 units of serum.

Such missed or atypical cases may or may not recover from the disease themselves, but from such sources dangerous epidemics arise. Until the medical profession learns to recognize the seriousness and prevalence of these atypical forms the mortality from this disease will remain far above what should be expected. More dependence must be placed in the health laboratories. That the majority of abnormal nasal and laryngeal conditions so prevalent in winter months are merely mild catarrhal inflammations is undoubtedly true; but that some of these seemingly unimportant "colds" are at times occasioned by virulent organisms is shown by the reports of epidemiologists. The health authorities make no charge for bacteriological examinations, every facility is available for immediate use, and reports are quickly rendered. Why, then, should diagnoses of even seemingly insignificant conditions be based entirely on clinical guesswork?

Physicians no longer make a bedside diagnosis of "biliousness," "intestinal indigestion," or "colic" when called to see a patient suffering from abdominal pain. There have been too many ruptured appendices and other grave complications for such unscientific work. The more serious conditions are first considered and their presence disproved. Blood counts, temperature and pulse records, and other data are immediately demanded. So also we must be sure that more serious conditions are not present before we give a diagnosis of "cold" or "simple tonsillitis."

It might be well to bear in mind Chapin's conclusions in regard to these undiagnosed and mild cases of diphtheria.[10] In his exhaustive study of the dangers from these sources he states that sometimes the disease-producing germs remain only a few weeks or months after convalescence, while at other times they may persist

for years, that, while the bacilli in the mild cases and carriers are sometimes lacking in virulence, many times they show the highest degree of virulence, and that there is ample epidemiological evidence to prove that mild unrecognized cases of diphtheria are the sources of well-marked epidemics.

SUMMARY

(1) The high death-rate from diphtheria may be traced to the following factors: the prevalence of atypical and undiagnosed cases; late diagnosis; late or insufficient prophylactic measures; inadequate use of antitoxin; and a quarantine that does not contemplate the isolation of "carriers."

(2) The facilities of health boards must be used to aid clinical diagnosis in all suspicious or lingering catarrhal conditions of the upper air-passages.

(3) Antitoxin is harmless and must be used in large amounts in serious cases. Mild cases diagnosed early demand not less than 3000 to 5000 units immediately, to be followed by a further administration of 5000 units or more at five-hour intervals if there is no improvement. Cases diagnosed late, or those of a serious laryngeal character, or those showing especially toxic symptoms, should receive from 10,000 to 20,000 units immediately, and this dosage should be repeated every four to six hours until there is a complete subsidence of symptoms.

(4) All diphtheria contacts or suspects should receive never less than 1000 units if above two years of age, and at least 500 units if under this age limit.

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THE MASKS OF DIABETES

A LECTURE DELIVERED AT FORDHAM UNIVERSITY SCHOOL OF MEDICINE

BY JAMES J. WALSH, M.D., Ph.D., Sc.D.,
Dean and Professor of the History of Medicine and of Nervous Diseases at Fordham University School of Medicine, New York

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GENTLEMEN: Some fifteen years ago a comparison of the frequency of diabetes in this country and in Europe presented a very interesting contrast. According to the statistics there were then about twice as many cases of this mysterious disturbance of sugar metabolism in the principal European countries as in the United States. Diabetes is, of course, a disease that occurs more frequently among the well-nourished and those of luxurious habits than among hard-workers and plain-livers. It was rather well understood, however, that the difference in the number of cases was probably not due to this fact, for the general living conditions were certainly not less luxurious in America than abroad. It was felt, too, that with our composite population, so many of whom came from foreign countries in which the percentage of diabetes was relatively large, we ought to have a very similar proportion of cases in this country. Neither climatic conditions nor general circumstances of living were thought sufficient to account for the difference.

The general impression among the more careful European clinicians was that many of our cases of diabetes were missed, an opinion which would seem to be confirmed by later developments. Our investigations of the conditions of patients generally were not as careful nor as exact as in the European clinics. It was not lack of knowledge so much as lack of time and absence of that systematic examination that does not permit such conditions to escape notice. As we have become more careful in diagnostic details the number of cases of diabetes reported in this country has increased and the disproportion between the occurrence of the disease in the United

States and in Europe has gradually diminished. There are, however, probably a good many cases of diabetes still missed, especially in early stages, which seems especially unfortunate, as it is at this time particularly that the best hope for successful treatment of the disease can be entertained. Besides, there are often many bothersome symptoms that develop during the period of non-recognition of the disease that can not for that reason be successfully treated.

It has seemed, therefore, well worth while to pick out such conditions as ought particularly to call the attention of physicians in general practice to the necessity of looking carefully for the presence of sugar in the urine. It is not that they do not know how to make the examinations, but somehow their attention in certain cases is not called to the necessity for making them. Doctors are sometimes a little sensitive about asking for samples of urine, unless they have some good reason for doing so. Some physicians have got themselves figuratively if not literally in bad odor among their patients by asking nearly all of them for samples of urine. One does not hear so much of "urine doctors" now as used to be the case, because it is felt that, after all, this solicitous investigation of all the features of a patient's nutrition and possible pathological processes is thoroughly justified. As it is not a special disease that the physician finds himself called upon to treat, but an individual suffering from a particular affection, it is extremely important to know as much as possible about that individual, and for this a reasonably detailed examination of the urine is an indispensable source of information. Every physician, however, cannot go into all of these cases with as much care as this, consequently some underlying constitutional conditions with serious pathology are missed.

Nearly always when there are mistakes of diagnosis it is not because of lack of knowledge that they are made, but because of lack of attention to the individual case, and that is oftener due to absolute lack of time than to any negligence on the part of the physician. It would be rather important, then, for the physician to know the cases in which an examination of the urine must surely be asked for, lest diabetes should be masked under symptoms that are sometimes not thought of as directly connected with the disease.

I feel all the more ready to make such suggestions because of some experiences among physicians themselves during the last five

years in whom diabetes remained for some time unsuspected. I remember distinctly a very well-known physician from a rather large city not far from New York who came presenting some vague neurotic symptoms that looked as though they might have a low-grade neuritis as their basis. The affection being double, I at once realized the necessity for having a good examination of the urine made, and we found, not a high percentage, but a well-marked amount of sugar present. Treatment for the diabetic condition did more to relieve the neurotic and apparently beginning neuritic symptoms than all the remedies that had been employed before. The achy feelings were worse on rainy days, and the patient had attributed them to rheumatism, had used the salicylates freely, with the temporary relief from pain that the coal-tar products give, and which is sometimes supposed to be an almost therapeutic test of the presence of rheumatism, because the salicylates in many minds are considered as specifics for that affection, but without any lasting benefit.

An extremely interesting feature of this case developed in the fact that for many months the patient had suffered from an eczema on one ear which had proved very intractable. He had been to several specialists and had become quite disturbed about it, much more because of its unsightliness than because of the annoyance which it gave him. While all sorts of remedies had been used, with only temporary relief at best and often without apparent benefit, the eczema cleared up promptly when such care was taken of his diet as lessened notably the proportion of sugar in his urine. A tendency to roughness and dryness of the skin that had existed before, and that had been supposed by himself to be rather an evidence of advancing years,—though he was only slightly past fifty,—than of any pathological condition, but which had added considerably to his discouragement over the eczema and his neurotic achiness, disappeared at the same time. In spite of the discovery of sugar in his urine he was very much better at the end of two months than he had been for some years.

It is evident that any skin lesion that proves obstinate under recognized modes of treatment should suggest the possibility of the presence of sugar in the urine. Every physician knows that this is true for carbuncles and furuncles or for the frequent occurrence

of pustular lesions of any kind. The presence of sugar in the blood seems to favor the growth of the micro-organisms that produce pus, and these have long been recognized as indications of a probable pathological glycosuria. It has not been generally considered, however, that other forms of obstinate skin conditions may develop on a basis of hyperglycæmia. It must not be forgotten, also, that diabetes may produce itchiness, and that various lesions may come as a consequence of this which are usually due to the inoculation of the bacilli of the skin during the rubbing process. We are not yet absolutely sure whether eczema is due to a pathogenic micro-organism or to a nervous or nutritional condition of the skin, but it is evident that diabetes may be the underlying cause in this as in other skin lesions. Subject as the skin is to unfavorable external influences at the periphery of the body, farthest away from the sources of nutrition, it is not surprising that when there is any disturbance of metabolism in the blood, pathological skin conditions should develop in connection with it.

One of the most frequent symptoms of diabetes, the significance of which is more often missed, perhaps, than any other, is neuritis. Many a neuritis seems quite inexplicable and its persistence and intractable character cannot be understood until the presence of sugar in the urine is recognized. Usually the nerve attacked is the sciatic nerve. At least it suffers more frequently than any other. Whenever double sciatica occurs any one who does not look for diabetes is almost unpardonably negligent.

Much has been said about the supposed or presumed affinity of the sciatic nerve for the toxins or the improperly metabolized products of diabetes. A good deal of ink has been wasted on this subject of the special tendencies of certain nerves to be affected by particular poisons or toxic substances. Lead is supposed to have a special affinity for the nerves to the muscles of the forearm, alcohol for the nerves that supply the anterior tibial muscles. The sciatic nerve is most frequently affected in diabetes, while the lumbar nerves are more often involved in the disturbance produced by the by-products of deranged metabolism, as a consequence of damp weather and exposure to storms and the like.

Personally I have always felt that it is not a question of special affinities, but of some exhaustion of the vitality of nerves with con-

sequent lessened vital resistance to any unfavorable condition. It must be realized that it is exactly the nerves of the forearm muscles, by which the painter makes up-and-down movements with his brush, that are the most used nerves in the painter's body. Alcoholic neuritis attacks particularly those who work outside and live a rather active life. In them the action of walking calls into play more nervous impulses that travel through the anterior peroneal nerves than perhaps any others in the body. The muscles they supply are comparatively small, and great activity is demanded of them. It is not surprising, then, that when alcohol affects the nerve-tissues particularly it should find in these nerves a *locus minoris resistentiæ*. Consequently the anterior peroneal neuritis so characteristic of alcoholism. In those who stand much or in general among people who sit down a great deal the sciatic nerve is one of the most used nerves in the body. That is, more is asked of it than of any other nerve. It is particularly in such people that diabetes develops, and especially among those who are stout. The effort of maintaining equilibrium in those whose centre of gravity, because of their abdominal protuberance, falls considerably forward of the normal point requires much exercise of function on the part of the sciatic nerve. Hence the tendency for it to be affected in diabetes, because diabetes occurs five times as frequently among the stout as it does among those who are thin.

It has, however, always seemed to me that diabetes might well attack any other nerve in the body that was being used to a considerable extent and its manifestations would be noticed first in the most used nerve, whichever that might be. A painter with diabetes would probably suffer with neuritis of the forearm, quite apart from his lead, though probably also in connection with it. A letter-carrier might well have his neuritis in his anterior tibial nerve without its necessarily being alcoholic if he were a sufferer from hyperglycæmia and had the irritation of nerves consequent upon that condition. I have seen an old-fashioned tailor, who sat "cross-legged like a Turk," develop his diabetic neuritis in his lumbar nerves. In those who sleep with a high pillow I have seen an obstinate neuritis of the nerves of the neck that seemed much easier to explain after I had found sugar in the urine.

As a rule, obstinate neuritis should lead to the suspicion of possible diabetes, and whenever it is double in any part of the body

to leave the urine unexamined would be a serious fault. The occurrence of such neuritis is of itself an illustration of the disturbance of tissues in general, and especially those of more delicate character that may occur in connection with diabetes.

A mask for diabetes that sometimes covers up the underlying disease, though really it should suggest a suspicion of its presence, is the soreness of the mouth and, especially, persistent soreness of the gums, which so often develops in diabetic patients. In some cases it is the first symptom noted. Occasionally a dentist will have been trying to cure the condition for some time before he finally refers to a physician, suspecting the possibility of some constitutional trouble. The underlying reason for the lesions is, of course, the presence of sugar in the secretions of the mouth and in the blood-stream of the muscles of the mucous membrane, which encourages the growth of various forms of micro-organisms, especially the *Fungi* or *Oïdia*. Nearly always in mouth lesions there is some definite underlying constitutional condition, and not merely a vague disturbance of the digestive tract, as is commonly thought.

The lower end of the digestive tube may suffer from symptoms not unlike those in the mouth. Soreness of the rectum may develop, pruritic conditions are not uncommon, and various larger or smaller purulent lesions may develop around the anus or sometimes within the rectum. I have seen several cases of diabetes that remained for a considerable time unrecognized, though under the treatment of a physician, when the diagnosed ailment was hemorrhoids and rectal irritation. The first symptom had been an itchy soreness around the anus, followed by the appearance of piles, and subsequently by smaller or larger pustular lesions. The whole train of symptoms had been set down as "itching piles," the old-fashioned term that is now really recognized only in what may be called newspaper medicine. It is not hard to understand just how piles come to be brought about in these patients. They pass very large quantities of urine and drain their systems rather thoroughly of fluids. Every possible source of fluid is called upon for contributions, and even the contents of the bowel are largely deprived of fluid by the osmotic tendencies set up in the intestinal mucous membrane. Hence the stools are hard, with the consequent production of piles. The irritation readily leads to inoculation with various purulent micro-

organisms, nearly always present on the skin in this region particularly, and in the fæces themselves. Diabetic patients and consumptive patients should always be warned never to force at stool, because either of them may set up even serious purulent or tuberculous processes in the rectum, the lesions caused by the passage of hard fæces becoming inoculated as a result of the lower resistive vitality of the patients and the special tendency in them to favor the growth of micro-organisms. As a rule, when anal or rectal complaints persist in spite of ordinary treatment or recur readily a careful examination of the urine should be made.

The cases that I have seen occurred in women mainly, and the failure of diagnosis of the underlying condition was apparently due to some delicacy of feeling with regard to examinations of the urine and perhaps insufficient examinations of the local condition actually present. The patients' own account of the condition was considered enough to justify the diagnosis of hemorrhoids in two cases, and in the third case the diagnosis of hemorrhoids was made though there was only anal pruritus and some small purulent lesions fostered by the diabetic condition.

Soreness in connection with the external genital organs is extremely common in diabetes and for the same reasons that corresponding conditions are found at the ends of the digestive tube, only here the sugar is present in large quantities and there is more likelihood of luxuriant growth of micro-organisms because of its presence. Many a balanitis or balanoposthitis that arouses astonishment because of its persistence or frequent recurrence really develops because of the sugary urine that is present, contaminating the mucous membrane. The most careful precautions as to cleanliness have to be instituted and maintained in these cases or there will surely be very annoying symptoms. This is particularly true with regard to stout people. In men the existence of a long foreskin predisposes to it. Whenever irritative lesions, especially slightly furuncular or in any way pustular in character, develop on the external genitals in either sex there must be question at once of the presence of sugar in the urine.

In general, wherever mucous membranes are exposed to the air or wherever the skin may be thin or secretory glands may be exposed to the action of dust, as in the ear, furuncular lesions occur

with special frequency in diabetic cases. Serenesses of the nose that give rise to a good deal of annoyance and that keep recurring in spite of careful attention, and even soreness of the eyes, must lead to the suspicion of the presence of sugar. The general principle is easy to understand; a persisting cutaneous or mucous condition probably means the presence in the blood of some irritative element or some disturbance of metabolism.

A very suspicious symptom that must always suggest the possibility of diabetes to a physician is the occurrence of cramps. Frequent cramps, especially if they are bilateral and occur whenever the patient is over-tired, and if they are repeated several times during the night, are in much more than half the cases due to diabetes. They represent that preliminary stage of irritation of nerves which so often proceeds to the extent of actual neuritis. Before the neuritic process is set up there must probably be an infection with some form of micro-organism. At least neuritis without some such extraneous element is very uncommon. The prognosis of the neuritis, then, is often not that of the diabetes itself, but of the infectious process that was set up in the nerve in this particular case. Microbes often exist in the blood of healthy human beings, apparently are often strained out of it into the urine without damage to the kidneys, and may circulate for some time without producing serious results, but wherever they find a place of low resistance they are likely to settle down and produce results. In the irritated nerves of the diabetic patient this is particularly likely to take place, hence the necessity for recognizing the existence of the diabetes early, in order to ameliorate the irritative condition of the nerves, which is due very probably to the disturbance of nutrition in them consequent upon the hyperglycæmic blood that is constantly passing through them.

As soon as cramps are noticed in diabetic cases, treatment should be undertaken in order to lessen the amount of sugar in the blood, so as thus to prevent the nervous irritation from becoming nerve inflammation. In this regard it must not be forgotten that while the nerves oftenest affected are the sciatic nerves, this is not because there is any special affinity of the toxins of diabetes or of the saccharin blood for these particular nerves, but because they are the most used nerves in the body. If a man is using other nerve-tracts,

much, however, in the sense of having a great many nervous impulses sent down to them, as, for instance, the arms in writing, filing, sawing, sweeping, lifting, or the like, or through the lumbar nerves because of stooping, lifting, pulling, then the irritative condition may be first manifest in these nerves and the prophylaxis of neuritis in them must be carefully attended to, first by lessening the glycæmia, but secondly by diminishing the amount of labor that is done for a time until the irritation of the nerves subsides and the blood gets in better condition for their nutrition. These are little things in the treatment of diabetes, but it can readily be seen that they are often important considerations for the patient and make it easy to understand how much the treatment of diabetes depends on the individual rather than on his specific ailment.

Very often the special form of the diabetes that is present in particular cases is masked because of the neurotic symptoms and the consequent disturbance of the nervous system with the effect upon the diabetic condition which results. It is important not to judge nor to attempt to form any definite opinion of the form of diabetes that is present until the patient has been under observation for a considerable period. Immediately after the announcement that there is diabetes there will always be an interval, longer or shorter, according to the particular individual, in which neurotic symptoms, as a consequence of worry and anxiety, will become manifest. These always react to increase the amount of sugar in the urine and to bring about such reactionary digestive symptoms as make the condition seem much worse than it really is. Patients will sometimes mope, sit in the house a great deal, not take sufficient exercise, develop loss of appetite and constipation, dwell upon their affection, perhaps read about it, talk about it to others, and generally make themselves much worse than they really are. This is particularly likely to be the case in physicians and trained nurses, or in educated people who have read about the disease or who readily obtain information with regard to it from various sources and make themselves worse by worry about it.

There are two clinical forms of diabetes. The severe type which develops under thirty-five, as a rule, runs a rather rapid course, and often brings about a fatal termination in the course of a few years, and then there is the milder form, noticed usually when the patient is

beyond fifty, sometimes discovered by accident, often running a masked course for some years and with proper care not likely to shorten the patient's life. It is particularly these latter cases that must be treated prudently and must not be disturbed by oversolicitude. Sometimes an absolutely rigid diet excluding almost completely all starches from the dietary is prescribed and followed for a time by the patient. Practically always this does harm, produces symptoms of dyspepsia, great depression, and a number of additional nervous symptoms, all of which are attributed by the patient to the diabetes, though they are really due to the artificial diet on which he has been placed. I know a number of physicians who are sufferers from diabetes, and they have told me that at the beginning they were very much disturbed by their condition and that the worry consequent upon their anxiety hampered their power to use sugar to a great degree and made their excretion of sugar much larger than it otherwise would have been. As a consequence they had concluded that their form of diabetes was much worse than it really was.

These physicians have said further that when they stopped worrying about the condition and got away from oversolicitude about their diet, taking comparatively small amounts of starchy substances, yet denying themselves almost nothing that they craved, their general condition was much better. Most of them felt that probably their diabetic condition had existed almost unnoticed for some years before the discovery of sugar in their urine, but they had a whole train of nervous symptoms and a striking deterioration of their metabolism for sugar from nervous causes when they first learned about their disease. It must not be forgotten, too, that, while sugar and starch metabolism is seriously disturbed, this does not hold equally for all forms of starch, and there are some surprising individual peculiarities. Above all, people who in their younger years have lived to a great extent on some such form of starch as that contained in potatoes, or in oatmeal, or other cereals, seem to retain the power to dispose of the sugar from this better than might be expected from their glycosuria. The starch from potatoes may often be consumed with less bad effect than that from bread. Patients often crave those foods to which they have been accustomed from very early years and that are sometimes denied them completely. To be told that one cannot have a thing always produces

the perverse effect on human nature of making the craving for that particular article rather intense. To be allowed even a small quantity of the substance, however, is usally sufficient to quiet the craving to a great extent.

While diabetes itself, then, may easily run a masked course, after its discovery the milder form of the disease, which very seldom disturbs patients seriously or shortens life, if they take any proper care of themselves, should not, because of nervous symptoms, be allowed to masquerade for a while as a severer form. In general, indeed, the reassurance of diabetic patients and the absence of over-solicitude with regard to their diet, so long as they are willing to follow such rules as are laid down for them carefully, is the best therapeutic asset that we have.

It should not be forgotten that in certain forms of diabetes the use of pancreatin will do much to reëstablish or reinforce the metabolic function for sugar. I have seen this now in a number of cases and know of its happening to others even where the form of diabetes seemed very severe. I have patients who can eat considerable quantities of starch, though much more limited than those allowed normal individuals, without detriment and without increase of glycosuria, while they are taking from half a drachm to a drachm of pancreatin a day, though they cannot do so if the pancreatin is omitted, without incurring all the consequences of increased glycosuria and a whole set of general symptoms.

The terminal conditions under which diabetes is masked are not so interesting as those which occur in the early stages because they are not so amenable to treatment. It is well to realize, however, just what they are, because such patients can be treated to better advantage, and the prognosis of the case is, as a rule, quite different from that which would be given for the other affections under which diabetes is masquerading. Probably the most frequent terminal condition in latent diabetes is tuberculosis. Diabetic patients are particularly liable to this disease. The presence of sugar in the blood which favors the growth of pus micro-organisms in the skin also apparently favors the growth of tubercle bacilli in the lungs. It is well known that some of the media on which tubercle bacilli grow most luxuriantly contain a certain amount of sugar. These saccharine additions represent a special attraction for the tubercle

bacilli. Unless care is exercised, then, to keep diabetic patients from contact with sufferers from tuberculosis, and unless the very earliest symptoms of the tuberculous condition are recognized and treated without delay, rather rapidly progressive cases of tuberculosis develop in such subjects for which little can be done, because our best therapeutic measure for the arrest of tuberculosis is an improvement in nutrition, and that becomes difficult when metabolism is so seriously disturbed.

The lesson of these cases is one of prophylaxis rather than of actual therapeutics. Diabetic patients must be warned about their danger in this matter. Besides, in most cases of tuberculosis, but above all when there is not prompt reaction under the fresh-air treatment with increased diet, the possibility of the presence of sugar in the urine must be thought of. If it is found, then the patient's nutrition will have to be increased or maintained by means of substances other than those which tuberculous people are often tempted to take. The starches and the sugars will have to be excluded to a great extent, though of course the diabetic patient who is a sufferer from tuberculosis can consume freely the milk, butter, eggs, bacon, and fatty materials which are the favorite prescriptions of those who hope to make head against the ravages of the tubercle bacilli. It must be borne in mind that just as on the skin there is more danger of diabetic patients suffering from boils and other indications of the favorable medium that their sugary blood presents to pus micro-organisms, so, too, in the lungs, not only does the tubercle bacillus grow better, but particularly the pus micro-organisms of secondary infection grow more luxuriantly, producing serious destructive processes and a condition in the lung tissue in which the natural resistive vitality against the tubercle bacillus, so far as it exists, is very much lowered. Indeed, there are a good many specialists in tuberculosis, of high authority, who insist that for the outlook of a particular patient in tuberculosis, more depends on the extent and the character of the secondary infection than on the primary infection with the tubercle bacillus. It is generally conceded now that the hectic fever formerly thought so characteristic of tuberculosis and the growth of the tubercle bacilli in the lungs is really due to the presence of secondary infecting micro-organisms. The old-fashioned name for a tuberculous abscess in a joint or other

tissues where the tubercle bacillus existed in pure culture was a cold abscess, because while considerable pus might be found on incision no temperature had been noted in the patient's history. The tubercle bacillus disturbs the pulse very early, but of itself deranges the temperature very little. Shortly after the opening of a cold abscess the temperature is likely to be noted, particularly if good drainage was not maintained. This has now come to be attributed to the secondary infection which almost inevitably takes place because of the free drainage necessary for such lesions. Such considerations make it very clear how important it is to recognize the presence of diabetes and treat it, or especially diminish the hyperglycæmia, since otherwise this will foster the growth of the microbes of secondary infection.

The other terminal affection under the guise of which diabetes has masqueraded is nephritis. This often gives the tired feelings, the disturbance of digestion, the tendency to coma or lethargy, and sometimes the pruritus and other skin lesions that may occur in connection with diabetes. If a considerable quantity of sugar is being passed there will nearly always be albumin in the urine. The irritation is great and there are also likely to be some casts and sometimes some blood-cells and other manifestations of a kidney affection. Under these conditions it is not surprising that sometimes, when special examinations as to the possible presence of sugar were not made, diabetes ran its course, under the guise of nephritis, and the scene closed in coma or with the development of tuberculosis on a diabetic basis. It is in this part of the statistics of diabetes that undoubtedly great improvement has come in recent years, with an increase in the number of reported cases of diabetes. Whenever the urine is examined now the presence or absence of sugar is always demonstrated. At least any physician who does not do this, since it is so easy to do in connection with other urinary examinations, is subjecting himself to very serious risks of missing important information that may change his views very radically as to the diagnosis of the ailment.

There is a form of diabetes that sometimes seriously disturbs physician and patient, yet in reported cases so far has never proved of serious significance after the first scare is over. This is pentosuria, or the passage through the urine of a pentatomic instead of a

hexatomic sugar. This runs in families, and gives many of the reactions in the urine that occur with ordinary glycosuria, but does not seriously disturb metabolism. There are enough cases of pentosuria on record now to make it clear that the condition must be looked for carefully, more with the idea of preventing confusion with the other form of diabetes than for its own sake.

In general, there are many individual peculiarities with regard to sugar metabolism that deserve to be studied in each case. There are some people who can take an abundance of milk without increase of sugar in the urine, though, of course, there is a considerable quantity of a special sugar in milk. Apparently the metabolism of these patients for milk-sugar has been very slightly if at all disturbed. Just in the same way honey may be permitted to many diabetic patients, probably indeed to most of them, because its sugar is in the form of mannite. There are some patients, however, on whom sugar metabolism, even honey, seems to have an unfavorable effect. The individual peculiarities with regard to potatoes and the cereals, which I have mentioned already, are worth while following out in each particular case, for they often prove of great help in permitting variations of diet. Not infrequently the articles of diet that patients most crave are those which they can use to a greater extent than might be expected without increase of sugar in the urine.

In general it may be said that in all of these cases the individual is much more important than his disease. It is a long while ago since dear old Dr. Parry, of Bath, said that it was more important to know the sort of patient that had a disease than the sort of disease the patient had, but this remark remains true for a great many diseases, even with all our advance in medicine. One person has one per cent. or less of sugar in the urine and has a great many symptoms in connection with it, and the general health and strength seems seriously disturbed; another person with three per cent. or more of sugar in the urine seems to get along very well, having no cramps, no boils, and being able to accomplish a good day's work. It is probable that we cannot modify the form of diabetes that a patient has. Occasional periods of abstinence from starchy materials absolutely appear to be better than to attempt to maintain a rigid diet. These intervals of starch-free diet seem to enable nature to get a better hold of the sugar metabolism of the body generally.

If diabetes is not allowed to mask itself for long and gentle rational treatment is begun early without serious disturbance of the patient by over-insistence on rigid diet, many diabetic patients run along for years of useful, reasonably happy life, not disturbed any more in reality than those who are over-stout, perhaps indeed not as much as those who have the corresponding disturbance of their fat metabolism to the sugar metabolism fault of the diabetics. Usually these diabetics die of intercurrent disease, and, while they are especially likely to develop tuberculosis, they are said to be rather immune from certain other diseases, as pneumonia, so that there are compensations in their condition. Every year after fifty that the patient lives adds to the likelihood that he will live out his full roll of years without shortening by his diabetes. The severe cases are severe from the beginning and nothing seems to do them much good. The mild cases are more benefited by gentle rational treatment than by any attempt to treat them with ultrachemical solicitude. They are human beings, not test-tubes, and the state of their minds means much for their general condition. Above all, they must be made to take a reasonable amount of exercise and not give up their ordinary occupation, but, on the contrary, be provided with an occupation of mind, if they have not one already, so as to keep them from hampering their sugar metabolism further by worry.

TWO STRANGE CASES OF FUNCTIONAL DISORDER, WITH REMARKS ON THE ASSOCIATION OF HYSTERIA AND MALINGERING

BY F. PARKES WEBER, M.A., M.D., F.R.C.P., Lond.
Physician to the German Hospital, London

FIRST CASE

THE first patient, T. B., is a woman, now forty-one years old, with whose case I first became acquainted in January, 1890, when I was house-surgeon for the late Sir William Savory, at St. Bartholomew's Hospital, London. I happened to be on duty when she was brought to the hospital, and had her admitted as an in-patient. For permission to publish the case I am indebted tc Sir A. A. Bowlby, who has enabled me to follow it up since then. I am likewise indebted for much information to Dr. W. W. Stabb, under whose care the patient was for a long time at a home in Torquay.

On admission to St. Bartholomew's Hospital, the patient, then nineteen years old, was fairly well-nourished, of medium size, with a rather asymmetrical face, and with slight spinal scoliosis. Since the age of ten years she had been subject to attacks of subcutaneous hemorrhage. These commenced in the right hand and recurred at irregular intervals, extending up the right forearm and arm. The affected arm was amputated above the elbow in 1888 (in the north of England), apparently on account of gangrene (or phlegmonous inflammation threatening gangrene), after several preliminary operations. Menstruation had commenced at fourteen years of age and had been regular since. For the last months the patient had suffered from severe attacks of vomiting, coming on at irregular intervals, irrespective of meals, but sometimes having relation to the menstrual periods. With these attacks large subcutaneous extravasations of blood, especially in the stump of the right arm and on the right side of the face (brow and forehead), were associated. In the hospital the parts affected by these hemorrhages looked shiny and purple, as if the skin were distended by a kind of acute hemorrhagic œdema

of the tissues below it. Between the attacks her general health was fair, but she seemed weak. The hemorrhage was not external, but into the subcutaneous tissue. There was never hæmoptysis, and blood was never passed from the bowel or kidneys. But once some dark blood was vomited, and Sir A. A. Bowlby tells me that at least on one occasion, when the mammary region was involved, some bloody fluid could be squeezed from the nipple. There was no evidence of any organic visceral disease. Typical attacks at St. Bartholomew's Hospital were as follows: "Malaise and headache—followed in one or two days by the appearance of hemorrhagic swellings in the subcutaneous tissues of various parts of the body. The patient becomes very much collapsed and vomits all food. Supposed hyperpyrexia. The hæmatomata gradually become absorbed and her general condition improves." Some of the swellings were aspirated and nothing but blood was drawn off. In December, 1891, a large swelling formed around the left knee; this swelling was incised and blood was let out; it then healed up. Incisions into the skin did not bleed more than in the case of healthy persons. There was no family history of hæmophilia or other hemorrhagic tendency. The urine, when examined, was apparently always free from albumin, sugar, and blood. During the latter part of her time at St. Bartholomew's Hospital the "attacks" seemed to have recurred somewhat less frequently than at first, but there was no very decided improvement.

On October 30, 1893, the patient was transferred from St. Bartholomew's Hospital to a home at Torquay. In the home the presence of some hysterical anæsthesia was noted, and the vomiting and abdominal pain (the pain had been complained of since 1891) were very troublesome. Gradually an improvement took place in regard to the attacks of vomiting and subcutaneous hemorrhages. Then these symptoms ceased altogether. The patient seemed, however, to have developed a tendency to malingering, and on one occasion she was discovered beating the stump of her right arm against something hard, apparently in order to produce an artificial "hemorrhagic attack"; she was likewise suspected of tampering with the thermometer so as to simulate fever. [It may be mentioned that "hyperpyrexia" had been noted at St. Bartholomew's Hospital, where apparently she began to "play tricks" with the thermometer, etc.]

I saw the patient again in 1905, a long time after the attacks of

subcutaneous blood-effusion or hemorrhagic œdema had ceased. She then had hysterical anæsthesia of the left lower extremity below the knee. There was some equinus contracture of both feet (especially on the right side), apparently resulting from hysterical paralysis and prolonged lying on her back. She was readmitted to St. Bartholomew's Hospital under Sir A. A. Bowlby, who succeeded in getting her on her feet again, by the help of a tenotomy and massage, with electrical treatment and mental encouragement. Since then I have seen her twice (the last time in November, 1910). She remains well and can help in house and domestic work.

A remarkable feature of this case was that the "swellings" were associated with subcutaneous extravasation of blood—a kind of acute circumscribed *hemorrhagic œdema.* I can find hardly any records at all of similar attacks of hemorrhagic œdema. Dr. Theodore Fisher, in the *Practitioner,*[1] described a case of "Recurrent Swelling of the Dorsum of the Hand Associated with the Appearance of Bruising." In that case swelling and bruising of the dorsum of the hand followed a blow with a wooden pointer by a somewhat irritated teacher, when the patient was about eleven and a half years old. Dr. Fisher first saw the child eighteen months later (July, 1898), when she was thirteen years old. The attacks of swelling, pain, and appearance of bruising were recurrent, lasting about three months or so and then disappearing and remaining absent for several months. In 1905 the patient was a tall, bright, intelligent young woman, twenty years of age, who had herself become a school-teacher. The swelling was still said to make its appearance two or three times a year. Dr. Fisher was likewise informed (by Mr. C. A. Morton) about a girl, aged twelve or thirteen years, who used to suffer from severe attacks of pain in one hand, followed by swelling and the appearance of bruising; the first attack had occurred immediately after a blow. Dr. Apert[2] speaks of a kind of recurrent hemorrhagic œdema (he terms it "œdème péliosique") in which the attacks are accompanied by pain and fever; the swollen area is pale at first, but by effusion of blood becomes red and afterward purple. In his cases there is no tendency for the mucous membranes to be involved (as there is in Quincke's acute angioneurotic œdema) and there is

[1] THEODORE FISHER: *Practitioner,* London, 1906, lxxvii, 474.
[2] Société médicale des hôpitaux de Paris, séance de 9 Décembre, 1904.

no family history of any similar trouble. T. K. Monro and A. N. McGregor [3] have described a case, possibly allied to Apert's class. Their patient, a man, aged twenty-eight years, was subject to paroxysms of pain and hemorrhagic swellings in various parts of the body, but (unlike Apert's type) the mucous membranes were more or less involved.

In this connection it may be noted that bluish swellings associated with subcutaneous hemorrhage not rarely occur in some women from quite trivial injuries. Grasping their arms may give rise to bruise-like marks without hurting them. In certain cases temporarily resembling pernicious anæmia, blue marks due to subcutaneous hemorrhage may appear spontaneously on various parts of the body.

In connection with this subject it may be also worth mentioning that A. Hauptmann has described the case of a neurotic girl in whom hemorrhages under the skin and mucous membrane of the upper and lower lips recurred every month, apparently in connection with or supplying the place of the ordinary menstrual discharges.[4]

SECOND CASE

The second case has been more or less under observation for the last fifteen years. The patient, now aged thirty-seven years, was first admitted to the German Hospital, London, on October 19, 1896, and I then had the opportunity of occasionally seeing her. Since then she has been on various occasions an in-patient under my care or under my observation. By the kindness of my colleagues, Dr. Michels and the late Dr. Port, I was enabled to publish a short account of the case in 1898,[5] and in 1904 [6] I published a more detailed study on the whole subject.

According to the history obtained, the patient, who was twenty-two years old on admission in 1896, had been quite healthy up till

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[3] Monro and McGregor: *Lancet*, London, 1904, i, 1039.

[4] A. Hauptmann: "Vikariierende Menstruation in Form von Lippenblutungen," *Muenchener med. Wochenschrift*, 1911, lvi, 2114. On ecchymoses recurring in connection with the menstrual periods, see also P. Opel: *Dermatologische Zeitschrift*, Berlin, 1908, xv, 98; and B. Stiller: *Berliner klin. Wochenschrift*, 1877, xiv, 731.

[5] *St. Bartholomew's Hospital Reports*, 1898, xxxiv, 315.

[6] "Fecal Vomiting and Reversed Peristalsis in Functional Nervous Disease," *Brain*, London, 1904, xxvii, 170–198.

the time of her marriage in that year. On the night of her marriage her husband is said to have had hæmoptysis and to have died not long afterward. The commencement of her symptoms apparently dated from that time. The chief of these symptoms were the following: vomiting (sometimes bringing up a little blood), distention of the abdomen, and great constipation. There was no evidence that the idea of possible pregnancy had anything to do with the distention of the abdomen, which was afterward found to disappear at once under chloroform. The vomiting persisted on and off. At one time there was undoubtedly fecal vomiting. Actual scybala or formed fæces from the large intestine were certainly vomited on more than one occasion. At times, when an oil enema was administered, some of the oil reappeared in the vomit. In order to guard against imposture and to obtain an accurate diagnosis, an enema colored with methylene blue was administered at the suggestion of Dr. zum Busch. Some of the methylene blue appeared in the vomited matter within ten minutes after the administration of the enema. Any deception on the patient's part was altogether impossible.

This observation and the history of hæmatemesis seemed to furnish reasonable grounds for supposing that a fistulous communication between the colon and stomach or duodenum might exist. It may be noted, however, that when the gastric contents were evacuated by the siphon tube immediately after an enema containing methylene blue had been administered, no methylene blue was found to be present in the contents of the stomach. This showed that the methylene blue injected by the rectum took at least some minutes to reach the stomach. Furthermore, there was no extreme emaciation, and Bec,[7] who collected the records of sixty-two cases of gastrocolic fistula and found that the usual cause was cancer or ulcer of the stomach, mentions among the chief symptoms abundant diarrhœa, which was certainly not present in this case.[8] However, to make a long story

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[7] Bec: Thèse de Lyon, 1897; quoted by H. D. Rolleston; *Practitioner*, London, 1899, lxiii, 199.

[8] Sometimes, however, gastrocolic fistula may be accompanied by constipation, as is shown by the experience of Brieger and Unruh, quoted by F. Perutz: "Zur Kenntniss der Magenkolonfisteln," *Med. Klinik*, Berlin, 1906, ii, 64. Perutz (*loc. cit.*) mentions another valuable diagnostic sign of gastrocolic fistula, namely, that fluid specially colored with methylene blue or eosin and poured into the stomach rapidly disappears and then reappears per rectum as a fluid motion of the particular color used.

short, it may be stated at once that during the patient's residence in the German Hospital two careful exploratory laparotomies were performed. At neither of them was any abnormal condition detected. The incision of one of the laparotomies was above the umbilicus, that of the other below. At the second operation the stomach itself was opened and explored. On both occasions the wound healed rapidly and no unsatisfactory results occurred. There may, indeed, have been some temporary improvement in the general condition following the operation. Any improvement there may have been was, however, certainly not permanent, and the patient's condition varied considerably at different times. While she was at the German Hospital her temperature was found every now and then to be apparently above the normal, especially when she was not being closely observed. It was not proved, however, that she simulated the fever by manipulating the thermometer. Before leaving the hospital (February 4, 1897) she looked well, had a fresh color, and moved about quickly, but was still troubled with vomiting, constipation, and distention of the abdomen.

Almost directly afterward she came under the care of Sir F. Treves at the London Hospital, and he has alluded to the case in his interesting paper on "Abdominal Section as a Medical Measure," read before the Medical Society of London on February 28, 1898.[9] At the London Hospital her symptoms were much the same as at the German Hospital, and a third laparotomy was performed, the contents of the abdomen being thoroughly explored, with a negative result. No evil results followed; on the contrary, the patient's condition afterward improved; but in September, 1898, she was again attending the out-patient department of the German Hospital for abdominal distention. It is interesting to note Sir F. Treves's confirmation of the vomiting of oil enemata, etc., while she was at the London Hospital. "An enema of castor oil was given; within ten minutes from the time of the introduction of this drug into the rectum, the whole of the castor oil, as demonstrated by actual measurement, was vomited from the mouth, together with a small scybalous mass. A few days later, in order to further test this phenomenon, an enema of one pint of water stained a deep color by methylene blue was injected into the rectum by the sister in the presence of the house

[9] *Transactions of the Medical Society of London*, 1898, xxi, 224.

surgeon. The whole of this enema, to the amount, that is, of one pint, was vomited by the mouth in ten minutes." At the London Hospital the patient admitted having endeavored to simulate hyperpyrexia by manipulating the thermometer.

In December, 1902, the patient was temporarily an in-patient under my care at the German Hospital for hysterical vomiting and "hysterical tympanites." As the abdomen and lower part of the thorax showed no respiratory movements, the tympanites seemed to be due to tonic contraction of the diaphragm combined with relaxation of the other abdominal muscles.[10] She at that time showed right-sided hemianæsthesia, hysterical contraction of the visual fields, and absence of pharyngeal reflex. She almost certainly tampered with the clinical thermometers, and one of them was broken on December 22, 1902. After that endeavors were made to prevent her simulating fever, and from that date till January 12, 1903, when she left the hospital, her temperature was never found to reach 100° F.

Afterward she was employed for a long time as cook at a boarding-house on the south coast of England, and apparently did her work well. But in the summer of 1908 she was supposed to have symptoms of gastric ulcer. In August, 1909, she was admitted to one of the large hospitals in London with a twelve months' history of vomiting, hæmatemesis, and pain. Her abdomen was extremely distended, and on August 25, 1909, a laparotomy (*the fourth laparotomy*) was performed as a supposed "urgency operation." The abdominal contents were thoroughly explored by one incision above and by another below the umbilicus. The gut was collapsed in places, but there was no obstruction, and no evidence of organic disease was detected (beyond the presence of scar-tissue resulting from previous operations). The wounds healed up well, but her condition remained unsatisfactory.

From December 31, 1909, to February 23, 1910, she was again an in-patient at the German Hospital. Her troubles were the usual abdominal distention, occasional vomiting, and pains, which she complained of in the abdomen and back. The vomit was found on one occasion to contain blood, which may have been swallowed with saliva from the mouth; on washing out the stomach no blood came

[10] Compare S. TALMA: *Berliner klin. Wochenschrift*, 1902, xxxix, 90.

away. By Röntgen ray examination of the abdomen after a bismuth meal (Dr. Dorner, February, 1910) the direction of the long axis of the stomach seemed to be somewhat abnormally vertical, suggesting that perhaps vomiting would be more easy for the patient than for ordinary individuals. In February, 1910, there was troublesome, though temporary, hysterical paresis of the left leg.

Since leaving the hospital, in February, 1910, up to the present time, she has frequently come up to the hospital as an out-patient. She says that, except once (doubtful), she has not menstruated since the last laparotomy, which was over two years ago. On the whole, she looks well and is well-nourished; the hysterical paresis of her leg has quite vanished. But for many months she has presented a bullous eruption on the front of the abdomen (and for some time also on the right leg), which is very resistant to treatment and is probably artificial in origin, due to some kind of irritation by the patient herself.* Recently she was obliged to look after an invalid mother, and this seemed to make her own mental condition more nearly normal. The mother suffered from pulmonary tuberculosis and diabetes mellitis (and died in September, 1911), and the patient herself has some impairment of resonance at the apex of one lung, but no signs of active tuberculosis.

In regard to this case, I cannot here enter into all the long and interesting literature of the subject, much of which I have elsewhere discussed.[11] From the results of many observations it appears that "fecal vomit" in organic obstruction of the bowel is seldom, if ever, more than "feculent"; that is to say, having the odor of fæces without containing obvious fecal masses. Vomiting of formed fæces, in the absence of gastrocolic fistula, practically only occurs in a very rare group of functional nervous cases, of which this case was an example. This may partly be accounted for by remembering that antiperistalsis, if it occurs at all, is likely to be more forcible when

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* In December, 1911, after this was written, the bullous eruption in question was definitely ascertained to be due to the local use of cantharides powder by the patient herself. Dark specks were observed in the raised epidermis over some fresh bullæ on the abdomen. These dark specks were found by microscopic examination to contain minute glistening greenish particles similar to those seen in the powder obtained (for comparison) by crushing up a dried specimen of the blistering beetle, *Cantharis vesicatoria*.

[11] F. P. Weber: *Brain, loc. cit.*

the muscular walls of the gut have not been previously weakened by overdistention or gross organic disease. I believe that fecal vomiting of functional nervous origin is merely a rare and extremely exaggerated form of ordinary hysterical vomiting, just as typical so-called "hysterical tympanites" (more or less due to tonic contraction of the diaphragm) may perhaps be regarded as a minor stage of the functional condition leading to hysterical vomiting. The vomiting in functional brain disease may sometimes be more violent and severe than it ever is in organic cerebral disease, since fecal vomiting is scarcely known to occur in cases of cerebral tumor, etc. Some light is thrown on this point by remembering that a delusion is apt to be more stable and better "organized" in a paranoiac (monomaniac), whose brain, could it be examined, would probably show no obvious change, than in a general paralytic, whose brain is the site of grave histologic changes. I believe also that some cases of supposed ordinary hysterical vomiting ought really to be regarded as on the borderland between hysteria and simulation, and I will explain my reason for this belief. It is, of course, well known that just as some kinds of animals differ from other kinds by their facility for vomiting or the reverse, so in the human race some individuals vomit more easily than others. I do not know whether this tendency to easy vomiting ever runs in families like the facility for rumination (which I suppose may be regarded as an equivalent in the upper alimentary canal to antiperistalsis in the lower alimentary canal) certainly sometimes does. But, anyhow, there are some persons, especially young women, who, even while they are in their ordinary state of health and quite flourishing in appearance, have a really marvellous facility for vomiting. Not only does the slightest temporary gastric disturbance cause them to throw up their food, but they have only to look at certain articles of food and think of the associated smells and tastes (for which they happen to have an aversion) in order to be able to vomit. This facility for vomiting may obviously be cultivated by mental processes and may be made use of by hysterical patients who are desirous (as hysterical patients often are) of attracting attention to themselves by malingering if they cannot do so by other means. It must be distinguished from the vomiting which some simulators of nervous diseases can induce at will after distending their stomachs with fluid, just as German university

students can (or used to be able to) induce vomiting without any difficulty after having filled their stomachs with beer.

REMARKS ON THE ASSOCIATION OF HYSTERIA WITH MALINGERING

Both these strange cases present many other points of interest which I cannot here discuss. In both cases organic changes were to some extent associated with the functional nervous symptoms. In neither case, it should be noted, was any method of psychical analysis (Freud) resorted to. I shall confine my further remarks to the subject of the association of functional nervous (hysterical) symptoms with simulation, an association not rarely met with, and well illustrated by both the above cases. My explanation of this association has been already given in a paper entitled "On the Association of Hysteria with Malingering, and on the Phylogenetic Aspect of Hysteria in Pathological Exaggeration (or Disorder) of Tertiary (Nervous) Sex Characters,"[12] but of course it must likewise be remembered that in girls and young women of the lower classes who for any reason have been kept long in hospitals the temptation toward malingering may become very great. In hysterical subjects this temptation may become irresistible. They may naturally dread return to the hard and wearisome dull routine of daily work and to the struggle for life, a struggle for which they feel themselves less well equipped than others.

Hysteria was at one time, as the derivation of the word from the Greek ὑστέρα ("uterus") shows, regarded as a disorder connected with the female sexual organs, but the frequent occurrence of similar symptoms in the male (hysteria being sometimes as pronounced in males as in females) has long since proved that the idea of the exclusive connection of hysteria with the female sexual organs is absurd.

Sex characters may be divided into: (1) primary, those concerned with the sexual organs; (2) secondary, those concerned with the breasts, the facial hair, the features, the voice, the form of the skeleton, the development of the skeletal muscles and the general conformation; and (3) tertiary. Tertiary sex characters are those dependent on the nervous system, including both characters of instinct and char-

[12] Royal Society of Medicine (London), Medical Section, Proceedings for November, 1911.

acters of mind (reasoning). Such nervous characters, unlike primary sex characters, are not the exclusive property of either sex; they are called male or female characters merely accordingly as they predominate in one or the other sex. From the phylogenetic point of view I believe that hysteria, or rather much of what is now grouped together as hysteria, may be regarded as a pathological exaggeration (or disorder) of certain tertiary (nervous) female sex characters.

According to this (phylogenetic) conception the exaggeration (or disorder) of so-called tertiary female sex characters in the male would account for occasional cases of "male hysteria." I am not here concerned with the temporary "hysterical" conditions not rarely observed in the male as the result of violent emotions, starvation, and grave nutritive disturbance, or as forming a familiar part of the effect of certain toxic substances, such as alcohol.

The phylogenetic aspect of hysteria is, as far as I can see, not necessarily opposed to Pierre Janet's, Babinski's, and some other modern views on the subject.

I shall not trouble to bring forward any special evidence here to prove that ordinary hysterical symptoms are frequently associated in the same patient with attempts to simulate disease, accident, or injury and with deception of all kinds ("mythomania," etc.). The fairly frequent occurrence of such association is recognized by all—so much so, that in a recent paper on "Hysteria and Mythomania" Dupré and Logre quote Hartemberg as maintaining that hysteria (which Charcot called *"la grande simulatrice"*) *"est d'essence mythopathique; elle peut se définer la mythomanie des syndromes."* [13] Moreover, the frequent use of the term "hysterical malingering," or "hysterical simulation," proves that the occurrence of such associations is generally acknowledged. In fact, hysteria is frequently characterized by two kinds of simulation of disease, or "pathomimia," if I may be allowed to borrow a term suggested by Paul Bourget for his friend Dr. Dieulafoy, who employed it in a remarkable communication to the Paris Academy of Medicine in 1908: (1) The unconscious mimicry of disease, so well referred to in the writings of Charcot, Sir James Paget, etc., to which the term "neuromimesis" has been usually applied; and (2) the conscious, more or less

[13] Proceedings of the Twenty-first Congress of Alienists and Neurologists, 1911, *Presse Médicale*, Paris, August 12, 1911, 660.

voluntary, imitation of disease that may be termed "hysterical malingering."

I need simply explain my conception of hysteria and my view of the kind of simulation so frequently associated with it ("hysterical malingering") in order to show what I believe to be the pathological connection between the two, though it is possible that some of the multitudinous morbid phenomena which have been described by various authors as "hysterical" may find no place in my scheme. To avoid confusion I shall refer only to such universally recognized features or symptoms of hysteria as: (*a*) "functional" muscular paralyses and spasms and hysterical convulsions; (*b*) hysterical pains and paræsthesiæ (hysterical "clavus," "globus," etc.); (*c*) hysterical disorders of the circulatory system (hysterical palpitation, pulse-irregularity, and vasomotor disorders); (*d*) the well-known suggestibility of hysterical persons and loss of spontaneous will-power. I maintain that all these features or symptoms of hysteria can be explained as resulting from pathologic exaggeration (or disorder) of tertiary (nervous) female sex characters, characters which, in normal degree, might have been useful in regard to selection by the other sex.

Thus *a* and *b* may be regarded as exaggerations of the slight ailments to which the "weaker sex" are supposed to be naturally more liable than the "stronger sex" and which call for the sympathetic interest of the protecting males. Some at least of the hysterical symptoms grouped under *c* may be regarded as representing an exaggeration of the normal vasomotor excitability ("erethism" if more than normal) of young females (including facile blushing and responsive emotional changes in pulse frequency), which constitute part of their attractiveness to the other sex. So also *d* may be regarded as an exaggeration of the tendency of the female mind to bend to the opinion of (male) authority, a tendency which when recognized as present is (or, has been) often gratifying (flattering) to the male.

I now come to the question of "hysterical malingering" and all kinds of deception and simulation without any adequate rational cause. In past ages (from early prehistoric times onward) simulation or deception of various kinds must often have been serviceable to the weaker female in protecting herself from the stronger (and

sometimes cruel) male, as well as in enabling her sometimes to get her own way by "getting round" her male partner. By a natural process of "survival of the fittest" the facility for effective deception would, in a barbarous age, persist or gradually increase in the females, that is to say, it would become a tertiary sex character; and it must be recognized that the average female of the present day seems not to have altogether lost this in-born aptitude for deception.

Of course, deception and "tricks" of various kinds were also often useful to the male in his struggle for life, but they were more necessary to the female, and therefore at the present time the facility (instinct) for deception is probably greater in the average female than in the average male.

In both sexes this tendency to deceive is normally from an early age kept in check by the exercise of memory and reason, but in many hysterics the tendency in question is present in such an abnormal (pathologic) degree that it cannot be suppressed. Such persons practise simulation and deception of various kinds without any adequate (rational) grounds, and such "hysterical malingering," hysterical "mythomania," etc., may be justly regarded, I think, as an exaggeration (or disorder) of an instinct resulting by a process of survival of the fittest from the necessities of our primitive (especially female) ancestors. According to this view the greater frequency of such "hysterical malingering," "hysterical mythomania," etc., in women than in men is explained as a result of the fact that the tendency or facility (instinct) for deception is normally greater in women than in men.

From my point of view, therefore, the intimate relationship of deception (without adequate, rational motives) to hysteria is clear. I would, in short, claim that most (but not necessarily all) of the phenomena ordinarily classed under the heading "hysteria" are dependent on a special kind of instability of the nervous system, and may be regarded as the expression of a pathologic exaggeration or disorder of certain tertiary (nervous) sex characters the presence of which, in normal degree, can be accounted for on a phylogenetic or evolutionary basis.

Some at least of the normal tertiary sex characters are psychical and are due to hereditary functional properties of the higher central nervous system, functional properties which have gradually developed

as the result of sexual selection and the survival of the fittest in past ages. The tendency to simulation and deception (without adequate motive) characteristic of some hysterical subjects may be regarded as an exaggeration (or disorder) of an instinct which is normally greater in women than in men, the greater prominence in woman of the tendency or instinct to deceive constituting a normal psychical sex character. Such psychical sex characters, whether normal or hysterical (*i.e.*, exaggerated or disordered), are not acquired by means of memory and reason, but are inborn or developmental "instincts;" the term "instincts" being here applied to functional reactive properties of the higher, psychical portion of the central nervous system, reactive properties which have been acquired, not owing to repeated ancestral, voluntary, or rational efforts, but simply owing to the laws of evolution acting by the survival of the fittest.*

Like other instincts (for instance, the instinct of self-preservation) they may be to some extent controlled by the exercise of memory and reason, and, on the other hand, may be rendered conspicuous and dangerous to their possessor (or their possessor's neighbors) by influences such as mental and physical overwork and shocks, which weaken the normal rational action of the mind in its restraining influence over the instincts. The therapeutic preventive indications are therefore largely educational, but prevention in such matters can obviously only be rendered really effectual by means of sexual selection and eugenics; in fact, just as sexual selection in the past is responsible for the existence of the tertiary (nervous) sex characters and their abnormal variations of the present day, so sexual selection in the present and future will modify the nervous sex characters, as well as all other instinctive nervous tendencies, of future generations.

* So, also, the protective nervous instinct which causes some insects to appear dead (or, as one incorrectly says, "sham death") when in the presence of animals who prey on them (but refuse to eat their dead bodies) develops, by the laws of evolution, as a result of the "survival of the fittest," just as "protective mimicry" does, owing to which some butterflies and insects have come, when resting, to resemble leaves of plants or twigs, etc.

THE PRESENT STATUS OF OUR KNOWLEDGE CONCERNING THE ETIOLOGY OF PELLAGRA

BY JOHN FUNKE, M.D.

ATLANTA, GA.

Professor of Pathology, Bacteriology, and Hygiene in the Atlanta College of Physicians and Surgeons

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Can we hold the etiology of pellagra as settled? Or is the matter to be regarded as obscure so long as one or the other of the alleged causes does not meet all the objections raised? The greatest stir recently created in regard to the cause of this disease is due to the writings of Sambon, who raised objections to the existing maize-intoxication theory as follows: (1) "There is no foundation whatever for the belief that pellagra broke out in Europe soon after the introduction of American maize." (2) "The topographical distribution of pellagra does not coincide either with the distribution of maize cultivation or with maize consumption." (3) "The disease occurs frequently in persons who have never or who have seldom eaten corn as an article of food." (4) "All the preventive measures based on the maize theory have failed." (5) "The characteristic skin eruptions and other symptoms of the disease may recur each spring for several years in patients who are far removed from the endemic districts and who have abstained from eating maize."

Sambon speaks of cases in Messina diagnosed as pseudo-pellagra because they had never eaten corn. He states that in Sicily corn products are rarely eaten, but adds that it is sometimes consumed when grilled over a charcoal fire. He writes of two cases reported by Mondini, of Genoa, both of which are supposed not to have contracted the disease either from the eating of maize or from the drinking of alcoholic corn derivatives. He mentions similar instances which occurred in Rome, where he had the privilege of personally examining the cases. Mention is made of a family of eleven cases at Forgiona who seldom ate maize. A municipal councillor

of Deruta, who was afflicted five years ago with an erythema on the back of the hands, which lasted for three years, reappearing each spring, diagnoses his affection as pellagra, other physicians refusing to do so because of his circumstances and social position. At Ponte Nuovo, Sambon saw a pellagrin, who ate little maize, carrying her grandchild, who had a marked pellagrous erythema on the hands and face and who had just been weaned by a non-pellagrous mother. He speaks of the examination of several pellagrous children ranging in age from five to twelve months none of whom had ever tasted corn.

Whether or not these are instances of atavism is probably a difficult matter to decide. Marie mentions such cases. He writes of a girl, aged sixteen, who at two years suffered with a chronic diarrhœa, at eight with vertigo, and at sixteen with typhoid pellagra and insanity. Her parents were healthy, but her grandfather died of pellagra.

Gout is not an analogous disease, yet authenticated instances are recorded where this disease developed in grandchildren the parents of whom escaped the malady. The cause of gout is not known, and it is possible that the appearance of gout in the grandchild or offspring is a mere coincidence, the parents having escaped the cause. The transmission of hæmophilia to the male offspring by an unaffected mother is known to all, although there is here, in all probability, a transmission of defective tissue, either solid or liquid. In discussing Friedreich's ataxia, Oppenheim states that, while this is a family disease, direct transmission is the unusual thing. Here again there is probably a defective tissue inherited. Although changes in the blood-vessels in the diseased area have been described, it is scarcely probable that such changes alone are responsible for the disease. The diminution in the size of the cord tends to confirm the view that the condition is the result of defective tissue transmission. Locomotor ataxia, which we hold is in the majority of instances the result of a syphilitic infection, may occur in individuals never attacked with this disease. As an illustration one can mention "tabes infantilis or juvenilis." The following case is rather typical. A man of good moral qualities at about the age of forty was seized with all the evidences of locomotor ataxia. Neither he nor his parents suffered a syphilitic infection, and they were tem-

perate in every other respect, but it was clearly shown that both his grandparents and great-grandparents passed through a specific infection. It was the consensus of opinion of all physicians who examined the case that the syphilitic infection of the ancestor should be held responsible for the locomotor ataxia in the patient herein discussed.

It is said that the biophores derived from either parent may retain their identity for some generations. It is possible that as a result of influences of toxic bodies the biophoric substances become so altered that during the process of differentiation changes occur in specific cells destined to form given organs, instituting such alterations recognized as a definite disease.

It has been clearly shown that poisons circulating in the blood have detrimental influences upon the germ cell, as illustrated by the experiments of Carriere, who found by the inoculation of the soluble products of the tubercle bacillus stillborn animals were a frequent occurrence, while those born alive were described as weaklings. The action of the poison was most marked when both male and female received the toxins. Lustig noted that the deleterious effects upon the germ cell continued long after the cessation of administration of abrin.

We know too little about heredity to draw any conclusions or make any inferences, but if deductions are made the hereditary transmission might apply equally well, as far as results induced by parasites or toxic agents are concerned; that is to say, the toxin or substances elaborated by the parasite or organisms would in all probability be responsible for the changes transmitted. So that the alterations which might take place in the biophores would be due to substances elaborated by living organisms either within the body or formed without and introduced into the body as poisons.

Our present knowledge of heredity is of little or no value to clear the haze enveloping the etiology of pellagra. Tabes dorsalis, a disease in a large majority of instances the result of an infection, is in itself not to be compared to syphilis as a disease, thus showing that tabes is in all probability the result of the action of a toxin and not the direct action of the spirochæta pallida; whereas if pellagra be transmitted the whole symptom complex of the disease manifests itself in the affected individual. Granting as we do that toxins

influence the developing cellular elements, it is hard to conceive of such a condition where the living exciting factor would pass through one generation inducing no changes and then in the next generation institute all the signs and symptoms of the disease as seen in the acquired condition.

From their investigations Regis and Mairet concluded that pellagra has disappeared from France, and that there exists now in the present generation of pellagrous ancestors only the hereditary taint manifested by mental troubles and erythema. Italian observers have described cranial defects in children of pellagrins.

To my mind the simulium transmission theory fails to explain the existence of pellagra in certain localities and it fails to explain the absence of the disease in localities where the simulium is abundant. I have spent a great deal of time along the rapidly running streams among the hills of Eastern Pennsylvania fighting the tormenting and annoying Buffalo gnat, and yet in that section pellagra is unknown. The cases reported in the northern part of the United States are found in asylums.

If the simulium occurs at all in cities it is rare—a fact admitted by Sambon himself. I have never seen the gnat in the city, and yet all who have studied the disease in this section know that pellagra occurs frequently in this city. Nearly all the cases I have seen lived in the country at one time, but one of these came to Atlanta twenty-eight years ago, others eight and some but one year before the onset of the disease. But Sambon insists that the incubation period could not be longer than five months and in all probability is not longer than three weeks. Merk thinks the incubation period is from seven to nine months, while Sandwith is inclined to believe it to be from nine to twelve months.

It must be admitted that some of the cases I have seen returned to the country on pleasure trips, but these are as a rule taken during the hot summer months when the simulium is not stirring.

Recently I saw a lady, who lived all her life along a brook in a simulium-infested country, afflicted with pellagra. The house in which the family lived was situated on a hill about one-half mile from the stream. The patient maintains that she spent very little time near the creek, and so far as she could recall was bitten very little by the gnat, although the husband was much annoyed by its

bite, since he spent a great deal of time outside of the house. The husband does not suffer with pellagra. They have both eaten corn for many years. Up until four years ago they grew and cured their own maize, but since that time they have been eating the meal of shipped corn. The lady was first attacked with pellagra three years ago.

In this connection these facts may be cited. Of a family, the lady alone ate the products of corn which was home raised and cured. On one occasion the husband took two lots of corn to be ground, one sound for the family and the other spoiled maize for the hogs. Upon the return of these two lots, by mistake the meal of the spoiled corn was placed where the meal of the sound maize should have been set. The mistake was not discovered until most of the meal of the spoiled corn had been used. Several months later the lady began to complain. The manifestations for a year and one-half were very vague, so that the diagnosis of pellagra was not made until the onset of the mental symptoms. My notes record the affliction of a family of four in whom the disease developed in the spring of 1911. About one year prior to that date a car of deteriorated Western corn was purchased, ground, and later eaten.

I cannot agree with Roberts in saying that the distribution of pellagra in this section of the country coincides with the distribution of simulium and I am somewhat loath to accept the method he adopted to reach his conclusions.

Considerable experimental work with the aqueous and alcoholic extracts of spoiled maize has been done. Alcoholic extracts of deteriorated polenta twenty-five days old, when injected in doses of 5 per cent. of the dog's body weight, produced a rise in temperature, acceleration of the pulse and respiratory movements, bloody diarrhœa, and paralysis of the hind legs. The paralysis may continue for several months. Peschel thinks the *Bacterium maidis* decomposes the albuminoid substances and hydrocarbons of the corn and produces toxic bodies. Cultures of this bacterium grown on blood serum when injected into animals produce febrile disturbances only, but no symptoms of pellagra. Spoiled corn, together with other foods, as milk, scraps of bread and meat, etc., fed to ten dogs for from six or eight months up to the end of life produced a diminution in weight in practically all the animals. There was

a rise in temperature in all and a reduction in the number of red blood-cells in all but two dogs, in which the number of red blood-cells was increased; one of these animals died in tetanic convulsions. A frequent, but not constant, symptom in these animals was muscular spasm. The most frequent symptom was diarrhœa; skin lesions were seen in one dog only. The *Sclerotium maidis* found in Colombia produces a falling out of the hair and nails of animals and paralysis of the hind legs. Alterations have been induced in frogs, rats, cats, chickens, and birds.

Farmers have noted the relationship between the feeding of spoiled corn to horses and the production of blind staggers, a condition in the horse in which there is clearly a mental aberration. Observation has also pointed out that the withdrawal of this class of food results in the cessation in the advancement of the disease.

The results of my experimental work on rats have so far not given any support to the above researches. The animals were divided into two lots; one received subcutaneously the aqueous, the other the alcoholic extract of spoiled corn. At the site of the injection the hair fell out and there was some roughness of the skin. But both of these conditions soon disappeared. The alcoholic extract seemed to produce the more marked changes. The animals which received the aqueous extracts were fed for two months with corn that had deteriorated in the laboratory, and were subjected to the action of the sun during the autumn months. No perceptible change has taken place in these animals, although the experiments will be continued in order to determine whether or not the action of the sun's rays during the spring months will bring out evidence of disease. The nature of the organisms in the spoiled corn was not studied.

It is always a question whether the changes produced by maize containing poisonous substances in animals are comparable to the alteration seen in patients suffering with pellagra. The experiments of Antonini, if authentic, lend great weight to the spoiled corn theory. While physician to a penitentiary he selected four workmen and three robust young peasants and fed them all winter on corn gruel only. In the spring they were all attacked with pellagra. A banker in the same institution also received corn gruel as well as cheese every day and became a chronic pellagrin.

When his diet was changed the disease disappeared. On the other hand, in the Hospital for Insane at Cairo, Egypt, the flour is carefully examined to see that it is free from maize, and yet patients residing in the institution for years develop pellagrous rashes, acute physical symptoms, and sometimes die.

Recently we have seen the statement accusing the ingredients of semidrying oils of producing pellagra. Mizell unhesitatingly declares that the ingestion of cotton-seed, maize, and sesame oils in large quantities, which cannot be disposed of normally, produces pellagra. These oils, he claims, are stored as neutral fats, and as a result of their oxidation deleterious products are formed which institute the disease. He reaches this conclusion from the fact that by means of potassium permanganate linoleic acid is oxidized to sativic, azelaic, and ultimately to isolinusic acid and aldehyde, according to the strength of the solution. The same reaction, but more slowly, he notes, takes place when linoleic acid is exposed to the oxygen of the air. Since the hæmoglobin carries oxygen to the tissues, he assumes, conditions in the body are comparable to those just mentioned.

According to C. A. Klein, linoleic acid on being exposed to the air absorbs oxygen, becomes thick, and ultimately so viscid that it will not flow, but remains colorless. By prolonged contact with the air, he says, the colorless hydroxylinoleic acid loses its viscid consistency and is converted into linoxyn, which is a neutral substance, insoluble in ether and the ordinary solvents; its constitution is unknown. The probabilities are that the linoxyn is not formed in the body from linoleic acid. Physiological chemists are fairly well convinced that reactions with substances obtained in a test-tube do not necessarily occur when the same substances are subjected to metabolic changes in the body.

There is probably no doubt that linoleic acid is absorbed, but most of it, if not all, is transformed into neutral fat during its passage through the intestinal wall and is stored as such. Munk has shown that if a dog be fed large quantities of fatty acids little or none of these bodies is found in the thoracic duct.

Rubner maintains that the human intestine can absorb about 330 grammes of fat daily, but Abderhalden holds that the human system, as a rule, can endure only from 100 to 120 grammes daily.

Suppose people do eat cotton-seed oil, that substance contains other ingredients than linoleic acid, and then, too, the foodstuffs with which cotton-seed oil is eaten are sources of energy. Cotton-seed oil, in addition to the linoleic acid, contains palmitic, a little stearic, and oleic acids.

Oleic acid when oxidized by means of potassium permanganate is, according to C. A. Klein, oxidized to dihydroxystearic acid, and when linoleic acid is treated in the same manner tetrahydroxystearic acid is formed; whereas, if the linoleic acid be treated with the potassium permanganate in an alkaline solution, sativic acid is produced, and when it is dehydrogenated stearic acid is the resulting substance. Who knows but that linoleic acid does suffer dehydrogenation in the process of metabolism. Judging from our present knowledge, there is no reason to make us believe that linoleic acid during the process of metabolism should produce any more or any more severely noxious bodies than does oleic acid, as they are very closely related fatty acids. Then, too, there is just as good reason for accusing oleic acid of producing pellagra.

Incident to the metabolic changes, the fats of the body, probably under the influence of a lipase or lipases, split into fatty acids and glycerol, and these are eventually oxidized to carbon dioxide and water, but of the intermediate products we know nothing, nor are we absolutely certain of the first step in the metabolism. In certain diseases, as in fevers, starvation, and diabetes mellitus, where excessive fat and to a certain extent protein destruction occur, acetone bodies are found in the urine. The beta-oxybutyric acid, which is probably derived from the fatty acids, by further oxidation, forms aceto-acetic acid, which in turn, by loss of carbon dioxide, produces acetone. Wakeman and Dakin showed that the oxidation of the beta-oxybutyric acid is accomplished by means of a substance derived from the liver, but is not contained within the liver-cells. They also showed that this oxidizing power of the substance is destroyed by heat, and that there is an enzyme in the liver which is capable of decomposing aceto-acetic acid. We know that as a result of an anæsthetic certain classes of patients pass considerable acetone and sometimes aceto-acetic acid in the urine. The effects of chloroform on the liver have been studied by many observers and we are familiar with the destruction that this organ suffers, and we also

know that it is changed as a result of the action of ether, but to a lesser degree and not nearly so frequently as by chloroform. Bearing these facts in mind, it would take but a little stretch of the imagination to make the suggestion that the liver plays an important part in fat metabolism and along the line discussed.

The presence of linoleic acid has been demonstrated in the fat of the silurus, sturgeon, seal, in hares, wild rabbits, wild boars, and the mountain cock. If that be true, is it not reasonable to suppose that the class of people who live largely on the flesh of such animals, and fish should develop pellagra? We are told that the lecithin in the yolk of eggs contains linoleic acid. Why do not patients treated for tuberculosis with a diet containing many eggs develop pellagra?

If the evidence presented be carefully examined one will probably conclude that neither theory satisfactorily explains all objections raised. The fact that the disease in the last few years has received so much attention necessarily puts physicians on the alert. Notwithstanding this discussion the number of cases reported in the northern part of the United States does not increase in proportion to the publicity given the disease, while in the southeastern section of the country the number of cases reported is exceedingly great, thus indicating that there is some factor at work in the latter locality which is clearly absent, or present in an insignificant degree, in the former. There can be no question about the difference in the quantity of corn consumption.

SUCTION DRAINAGE COMBINED WITH IRRIGATION IN A NEW PORTABLE WATER VACUUM PUMP

BY NATHAN G. BOZEMAN, M.D., Ph.B.,
NEW YORK, N. Y.

WHEN the writer first conceived the idea of using the vacuum pump for drainage no systematic use of it had been previously made in surgery; [1] and a paper published in the *Medical News,* March 22, 1890, with description of an instrument for this purpose, terminated in the following paragraph:

> The employment of continuous suction in a very simple and efficient way in the application of this catheter makes it different from any of the double-current catheters that I have seen. Besides the use for which I devised this instrument, I have employed it with great satisfaction for irrigating deep sinuses and pus cavities. During the operation for closure of urinary fistula, in the supported knee-chest position, it is invaluable for keeping the cavity of the bladder and the wound free from urine and blood.

Now the application of the principle involved has become of sufficient importance as to induce our leading hospitals to install plants directly connected with the house water-pressure or to the injector of the steam boiler in the cellar to procure a vacuum for use in their operating rooms.

In several publications descriptive of a portable water vacuum pump the writer has demonstrated that by mechanical subdivision a limited quantity of water falling down a vertical tube carries air with it and produces a vacuum proportionate to the length of the tube, offering various uses in surgery, especially since irrigation can be easily combined with it.

The accompanying illustration shows such an apparatus in a most compact shape: the suction tube or pump, the double-current drainage-tube or catheter, and the metal reservoir being component parts of it. Each of these may be disjointed from the others when not in use for

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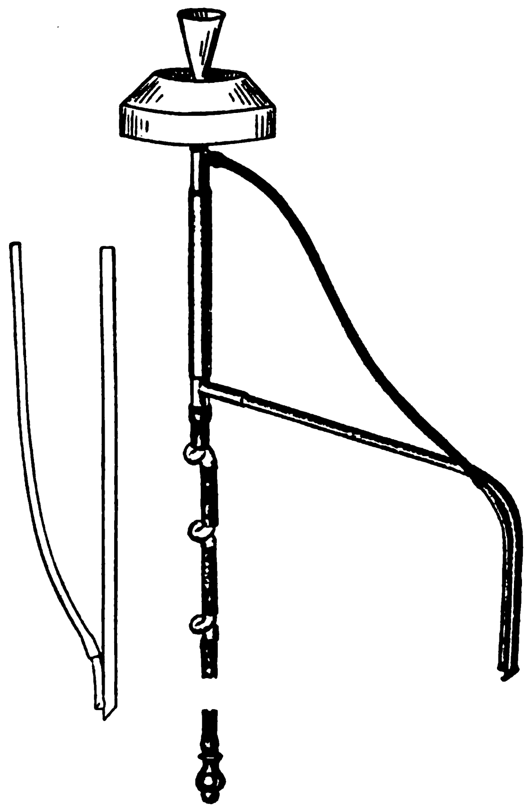
[1] The after-treatment of colpo-uretero-cystotomy and other similar operations by a new system of continuous irrigation and drainage, *New York Med. Journ.*, June 1, 1889.

sterilizing and convenient handling. It is controlled by the operator, and when the metal drum surrounding the upper part of the vertical tube which is held in the hand is filled with water immediately a current of air and water passes through the distal end of the double-current drainage-tube, exerting an aspiratory action. When the tube is introduced into a cavity or on a bleeding surface fluids,

FIG. 1.



Portable water vacuum pump.

whether blood or pus, are carried off into the glass coils of the suction tube, when they become visible, and then on into a vessel on the floor. When flushing is desired, solutions are poured into the funnel and by their force of fall capillarity in the tube is overcome and they gush out of the end, but suction being continuous and automatic the cavity is soon evacuated.

All this is accomplished without any particular mechanism except a circular hole (0.003316 square inch) in the tube traversing the bottom of the drum, the vertical height being 2 inches, and another circular perforation (0.000829 square inch) at its lower extremity, the vertical height being 7 inches. A certain ratio exists in the proportion of water entering this vertical tube, and efflux from it into the glass coils and pendent soft rubber tube; the latter produces the vacuum and the overflow from the former falls down intermittently, carrying air into the end of the drainage-tube, which prevents suction on the tissues, but carries off in the current blood and pus, obstruction at the point being removed by continuous exhaust exerted by the pump.

In manipulation the end of the drainage-tube is rubbed against the surface to be cleansed and the suction tube, with the glass coils, is kept vertically suspended by the side of the patient. The metal drum is the reservoir. It has a capacity of 16 ounces of water, which is voided in ten or twelve minutes. The right-angled double-current drainage-tube is for laparotomies; the straight one in the upper right-hand corner of the illustration may be substituted and bent in suitable shape for other operations.

Surgery

AN ABSTRACT REPORT OF A CASE OF TRANSPLANTATION OF A TESTICLE.

BY LEVI J. HAMMOND, M.D.,
Surgeon to the Methodist Episcopal Hospital, Philadelphia,

AND

HOWARD A. SUTTON, M.D.,
Assistant Surgeon to the Methodist Episcopal Hospital; Assistant in Anatomy, University of Pennsylvania, Philadelphia.

CLINICAL DATA

THE young man was nineteen years old on January 10, 1912; is five feet eight inches high; and weighs 124 pounds. He is an elevator operator by occupation; an only child, and is not now, nor ever has been, of robust build. On the 28th of July last, while asleep on the floor, he was playfully kicked in the scrotum by a twelve-year-old boy. He said that this caused him quite a little pain for about an hour, but that he paid no further attention to it until several days later, when he noticed considerable swelling. The subject denies ever having had any venereal trouble. On August 30th he presented himself for examination at the office of one of us [Dr. Sutton], saying that he had come more on account of the inconvenience of the swelling than on account of any other symptoms. At this time the right testicle was considerably swollen, the long circumference being 10¼ inches, and the transverse circumference 8 inches. The skin was not tense, nor did the organ have any particular sense of hardness, and not more than an ordinary amount of pain on pressure; the appearance did not follow the classic pyriform hydrocele shape, but nevertheless the light test was tried, with negative results; aspiration, by means of the hypodermic needle, was also tried and was also negative. There was some drawing sensation in the right groin from the weight of the organ,

so that the patient maintained elevation of the part by means of a jock-strap. The family history showed nothing noteworthy except that his mother in March of last year had her left breast amputated, presumably for cancer. From the time of his presenting himself he was averse to any operative procedure, so that, although he was told that the trouble was either tuberculous or sarcomatous in nature, he insisted upon other measures being tried before considering any radical measure. Various local remedies having been used without effect, and with the tumor rapidly and progressively increasing in size, he finally gave his consent, and was operated upon November 13, 1911. It occurred to us that for æsthetic reasons as well as for preventing any form of hypochondriasis it might be well to substitute an artificial testicle after the removal of the diseased one, so we decided to attempt the transplantation of a testicle from a live sheep, and arrangements were made at the hospital for this purpose; but the thought came to us, if this transplantation can be successfully performed, why not substitute the human organ rather than one from the lower animal?

The results of the experimental work in blood-vessel anastomosis in the lower animals were explained to the patient, and the justification in undertaking the measure we intended in his particular case was believed to be perfectly clear, so that the possibility of replacing his diseased organ by implanting a healthy one was left entirely to his own decision after assuring him of our willingness to undertake the experiment. The opportunity was enthusiastically accepted by him, and the details incident to the operative procedure were sources of entertainment to him. We at once set about to find a healthy testicle. This we succeeded in doing at 7 o'clock P.M., Sunday, November 12th. It was secured from a man twenty-eight years of age, who had died from hemorrhage following a rupture of the liver. The subject was carefully examined for local evidences of disease, such as, for example, would have been evidenced by scars, glandular enlargement, teeth defects, deformities, alopecia, etc.; and post-mortem study was made of all his organs immediately after the removal of the gland, and (with the single exception of fragmentation of the liver and the local acute trauma) there was no macroscopic evidence of either past or present disease. The testicle was removed under careful aseptic precautions, the vessels immediately

flushed with sterile normal saline solution to remove clots, if present (there were none, however, because of the thorough exsanguination of the tissues), placed in a sterile jar containing sterile normal salt solution, and within nine minutes from the time it was removed from the subject it was placed in cold storage (about 40° F.), where it was kept sealed within the jar till 12.30 P.M. the following day, Monday, November 13th, when it was anastomosed to the vessels of the cord from which the diseased gland had just been removed; about seventeen hours elapsed between its removal and implantation, and about nineteen and one-half hours that total function had been suspended.

THE OPERATION

The usual line of excision having been made by one of us [Dr. Hammond], the organ was exposed to view and carefully stripped out from its tunica vaginalis, which was left *in situ.* The vessels, nerve, and vas deferens were then stripped from their surrounding tissue and carefully severed; the vein, very close to the internal ring so as to avoid the innumerable branches of the panpiniform plexus, out of which the central vein in this position is formed; the artery, fairly close to the organ well below the junction where the artery of the vas deferens joins the spermatic; and the vas deferens itself, about midway between. Each of these structures was held in its normal position by a rubber-covered hæmostatic clamp, with just sufficient pressure to prevent their retraction but not enough to cause any bruising. The diseased organ was then entirely removed. The organ for transplantation, which in its removal had had the various structures severed with the idea of bringing them in the best possible apposition to the corresponding structures of the patient, was then procured. All during the time the testicle was exposed in the work of transplanting it, irrigation with hot normal saline solution was kept up.

The organ was then placed within the scrotum so that the two tunicæ vaginales were throughout their entire extent in juxtaposition, and the various other severed structures of the patient and the transplanted organ were placed in apposition, respectively. The artery was held end to end and a tension suture brought the inner walls close together; this was followed by an overlapping suture

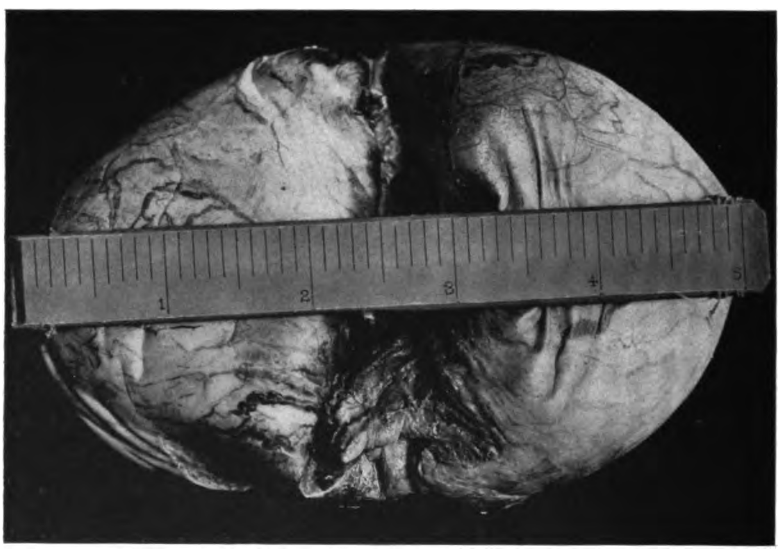
FIG. 1.

Appearance of the external genitalia on January 11, 1912, of patient whose right testicle had been removed after undergoing sarcomatous degeneration, and the spermatic vessels anastomosed to the testicle of one killed by violence.

Fig. 2.

Cut section of sarcomatous testicle removed by Dr. Hammond. (Same scale as in Fig. 3.)

Fig. 3.



External view of incised sarcomatous testicle removed by Dr. Hammond.

around the circumference (No. 0 linen thread and a fine cambric needle were used); similarly the vein ends were brought together, and, lastly, the vas deferens. No attempt was made at uniting nerve structure. The various tissues consisting of the areolar tissue, the tunica vaginalis and the cremasteric muscle from within outward were in turn united and the skin closed, with the exception of the dependent point.

The operative details consisted in uniting with linen the spermatic artery and vein, spermatic duct, suturing the areolar tissue, the tunica vaginalis, and the cremasteric muscle, placing each in the scrotum and closing the scrotal incision with silk-worm gut, except at its utmost dependent point, where it was left gaping for the purpose of inspecting its subsequent course.

Before leaving the table the arterial circulation was re-establishing itself. The organ was neither elevated nor allowed by its weight to cause traction upon the recently connected structures, but supported merely by a specially constructed muslin suspension attached to a circular bandage around the patient's waist, and the patient kept absolutely immobile in the supine position for four days. Through slight leaking and considerable connective tissue œdema the scrotum filled rapidly to approximately the size it was before the removal of the diseased testicle. There was no shock immediately after the operation nor was there any general systemic effect, subsequently, as evidenced by a practically normal chart; nor were there any noteworthy local symptoms till the seventh day, when slight bleeding occurred through the gape in the incision. An examination disclosed the detached tunica vaginalis which had been left on the gland of the supplier; careful traction daily for several days was all that was necessary to remove it, without in any way disturbing cord anastomosis. We are disposed to the view that, as the tunica vaginalis of the recipient was not removed, being apparently healthy, that of the supplier had best not have been retained, though its peeling off seemed in no way to affect the otherwise favorable course of the transplantation.

The patient left the hospital twenty-three days after admission (December 6th) with apparently well-established union of the vessels and circulation through the testicle; immediately after anastomosis, and even before the organ had been closed from view

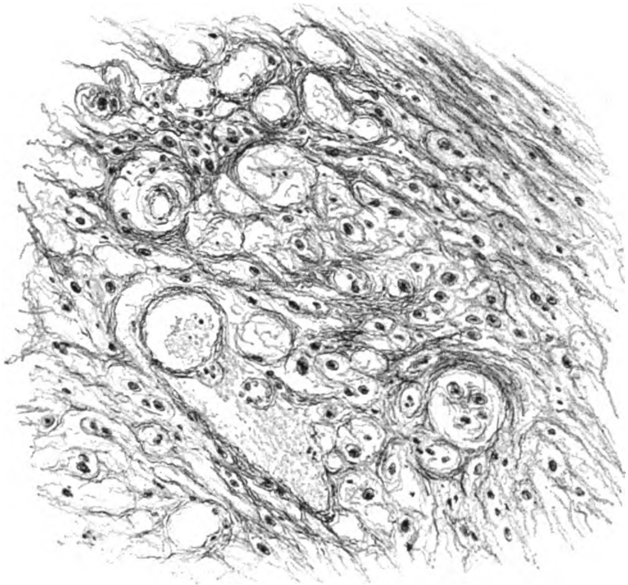
by suturing the scrotum, there was evidence of circulation having already taken place, it having changed from the characteristic death-like syncope to a distinct pink appearance. We again examined the young man on December 10th, four days after leaving the hospital, and found the gland still in size, shape, and position apparently as normal as the left one, with, on palpation, evidences of beginning sensation within it. When seen again last Friday, or one month later, to our surprise and, we may add, disappointment, we find the testicle markedly atrophied, leaving but a small knob at the end of the chord. The chord anastomosis, however, which can be easily palpated, seems quite as normal as its fellow of the opposite side. Just why this rapid disappearance of the gland, after the healing process may be said to have been completed, took place we cannot undertake to explain. Was it digested by the tunica vaginalis of the recipient—for we know that the peritoneum is capable of such—or was it due to an ultimate or late embolus or thrombosis, or to the definite action of the embryologic tissues connected with repair following an early injury? Time and future experience must answer this question. We await with interest the subsequent conduct of this mere knob of testicle.

The illustrations show the external appearance of the parts on January 11, 1912 (Fig. 1); the sarcomatous testicle, after removal, two views (Figs. 2 and 3); and the microscopical aspects of the tumor (Figs. 4 and 5).

The effort cannot be considered wholly a failure, since it demonstrates (1) that anastomosis of even these minute vessels is possible; (2) that, under proper precautions, tissues, from subjects dying from injury and free from disease, can be removed, preserved, and utilized in living tissues, without producing the slightest general systemic disturbances. Certain it is that the future, in developing better technique, shall have just reason for expecting a proportion of successes following such operative procedure.

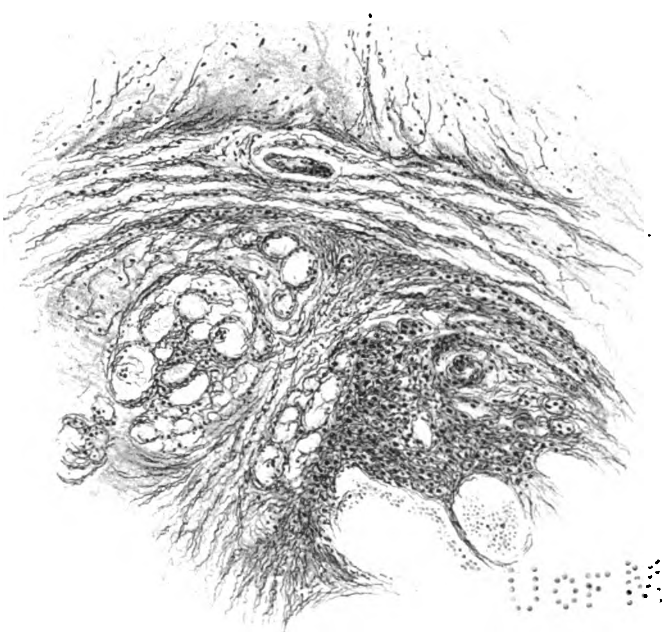
Just before going to press the patient was examined again, and there is evidently some increase in size since making our report; the organ which began to atrophy shows now at this date (February 2d) increasing development. It is to be hoped that there will be no recrudescence of the malignant process.

Fig. 4.



Microscopical appearance of sarcomatous testicle.

Fig. 5.



Microscopical appearance of sarcomatous testicle.

TIC DOULOUREUX—ITS TREATMENT BY PERIPHERAL OPERATIONS

BY AUGUST SCHACHNER, M.D.

LOUISVILLE, KENTUCKY

The medical treatment of tic douloureux can with perfect fairness be dismissed as absolutely futile. This applies with especial force to morphine, which Krause says should be banished from the therapeutics of neuralgia as from those of intestinal obstruction. Its use is a grave blunder; ever-increasing doses are required, and the patient becomes both a mental and physical wreck.

In the majority of cases, the disturbing factor is probably an ascending neuritis, and therefore an early operation of the peripheral variety may in many instances effect a permanent cure. In those cases in which the trouble is of central origin the peripheral operation will obviously be devoid of benefit. The differentiation of the peripheral cause from the central is not always easy. In endeavoring to establish this the extraction of sound teeth is sometimes resorted to, a procedure in regard to which Hutchinson very properly says, "The extraction of sound teeth that have nothing to do with the disease, but the loss of which never fails in mutilating the patient, should be condemned as unjustifiable."

The second division is most frequently attacked, then the third, or, if the third is first attacked, the second follows. The first division is never primarily involved, and is only secondarily affected late in the course of the disease. In fact, some go so far as to say that the first division is never involved. Where there is pain in the supra-orbital region alone it is almost certain to be a minor and not a major neuralgia, and is generally due to eye-strain or inflammation of the frontal, sphenoidal, or ethmoidal sinuses, syphilis, or perhaps exposure to cold. It is nearly always unilateral, but where its origin is dependent upon central causes it may be bilateral.

Although this affection occurs most frequently between the ages of twenty-five and sixty, it has been known at and before the age of

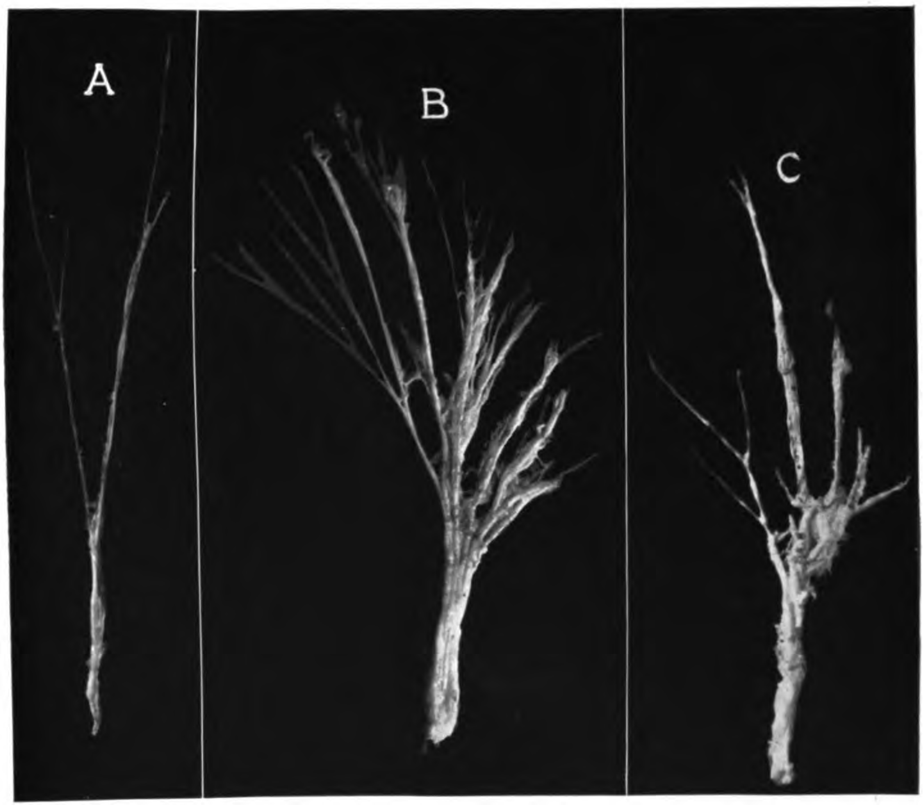
puberty. According to Krause it is more common in the female than the male. To this view there are dissenting opinions. Spontaneous cure is unknown. Its usual course is increasing frequency in the number and severity of the attacks, with a corresponding decrease in the length of time marking the intervals between. After the disease has progressed for many years, there may be an interval of unusual length, six or eight months, or even longer, which has given rise to the belief that a cure has been effected, or that the trouble has spontaneously ceased. An attack can frequently be provoked by an exposure to cold air, or by cold drinks or ices. Chewing, talking, or any muscular effort involving the face is also capable of precipitating an onset.

There are special points in the trigeminal field where the pain is more commonly experienced, and these have been called "pain points," *e.g.,* supra-orbital foramen, supra-orbital point, palpebral point, where the pain occurs in the middle or the outer half of the upper lid, or the inner half of the lower lid, nasal point, and the side of the nose at the junction of the bone and cartilage. In the second division, the pain points are the infra-orbital foramen, infra-orbital point, and at a point between the upper lip and the ala of the nose. In the third division the common pain points are at the mental foramen, the side of the tongue, and in the auriculotemporal region. The pain is modified or relieved momentarily by vigorous rubbing with a handkerchief or by pinching. In one case the patient produced a bald area in the temporal region largely through the almost incessant rubbing with his handkerchief.

The three procedures that present themselves to the surgeon are: (1) deep alcoholic injections of the nerves; (2) peripheral operations (neurexeresis) (Thiersch); (3) extirpation of the gasserian ganglion. There is also a class of operations neither peripheral nor central; they have none of the safety and simplicity that attend a peripheral operation, nor any of the radical features that accompany the gasserian operation. In all but exceptional instances, those operations which possess the disadvantages of both without the special advantages of either have very little to recommend them.

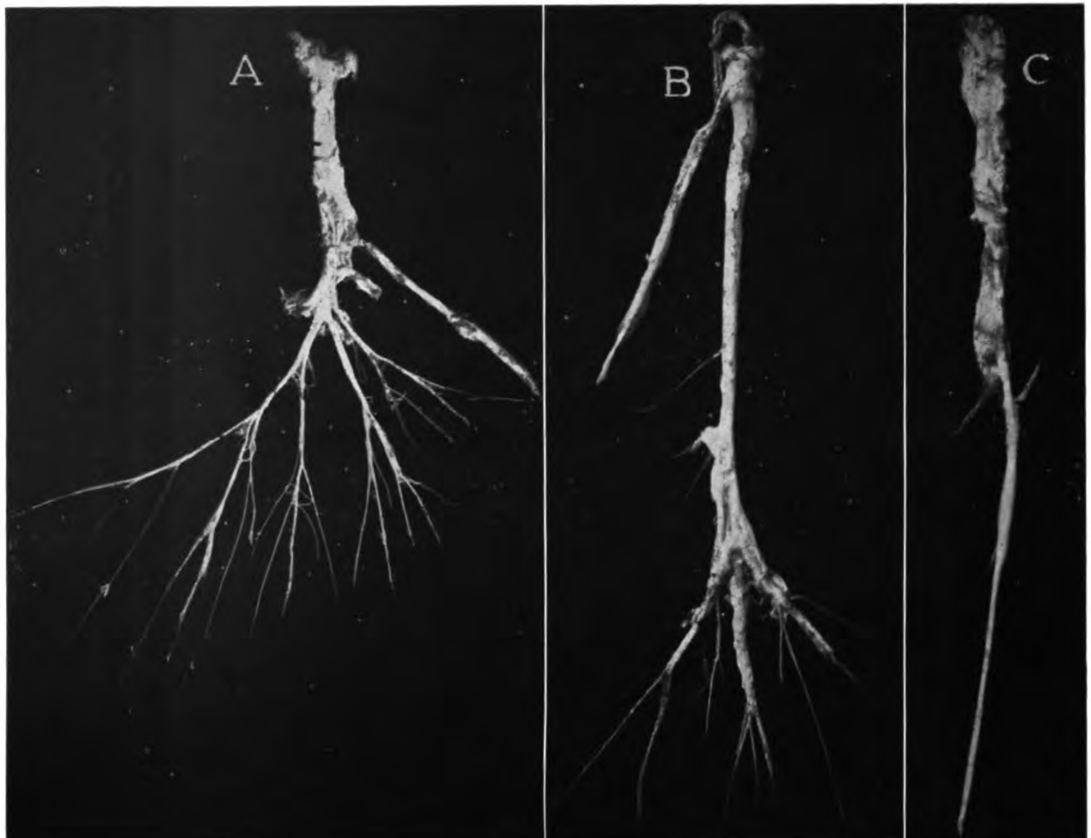
The employment of the first procedure, *i.e.,* the deep injection of the nerve with seventy-five per cent. alcohol at its foramen of exit, has found a more general employment than perhaps its real merit

Fig. 1.



A Supra-orbital nerve. *B*. Infra-orbital nerve *C*. Inferior maxillary nerve. (Natural size.)

FIG. 2.



A. Infra-orbital nerve. *B*. Inferior maxillary nerve, section removed at the mental foramen. *C*. Inferior maxillary nerve, section removed through the trephine opening at the junction of the body and ramus.

would justify. In subjects with myocardial changes, untrustworthy renal conditions, and in the extremely old and feeble is found its principal field of usefulness. It has the advantage of simplicity, as an anæsthetic is not required, and if necessary it can be employed in the office or at the patient's home; but frequently several injections are necessary before the nerve is reached, and the period of relief is as a rule less than a year, a fair average being about eight months.

The inferior maxillary nerve at the foramen ovale lends itself best to injections. It is not as easy to find the superior maxillary at or near the foramen rotundum as it is to find the former. As for the first division, that, I think, involves too much risk to the eye if a deep injection is contemplated. A superficial injection at the supra-orbital notch may be considered for what good it may yield.

The peripheral operation should involve no further risk than that which attends an ether anæsthesia. The period of freedom from pain is at least twice as long as that secured by the alcohol injection, and if the condition is not far advanced it may be three or more times as long, with some possibility of a permanent cure. It is mainly the extended period of relief and the prospect of cure that justify the use of an anæsthetic and the removal of large sections, or, more properly speaking, the extraction, of nerves, rather than the temporizing procedure of repeated injections. Although the peripheral operation should be given preference over either the method of injection with alcohol or the more serious and radical procedure of attacking the ganglion, there are cases that are plainly eligible to the gasserian operation. Where all the divisions are involved it is useless to advise anything short of the extirpation of the ganglion, or, what is preferable, the division of the sensory root as advised by Frazier and Spiller. Where the second and third divisions are involved to the deeper part, such as the orbital or the posterior dental branches of the superior maxillary, or the auriculotemporal of the inferior maxillary, the radical operation may be considered in good surgical subjects.

The objection to this operation is, of course, its risks, but these depend to a great extent on the ability of the surgeon in handling the details of the operation. A low mortality cannot be expected by an inexperienced operator, even though he may be a most experienced surgeon along other lines. Therefore we have two classes of opera-

tors doing gasserian ganglion surgery: those who have carefully mastered the details and whose results are attended with the surprisingly low mortality of about five per cent. or even less, and those who have not taken the same pains to overcome all the difficulties, although perhaps otherwise thoroughly competent operators, with a mortality of about fifty per cent.

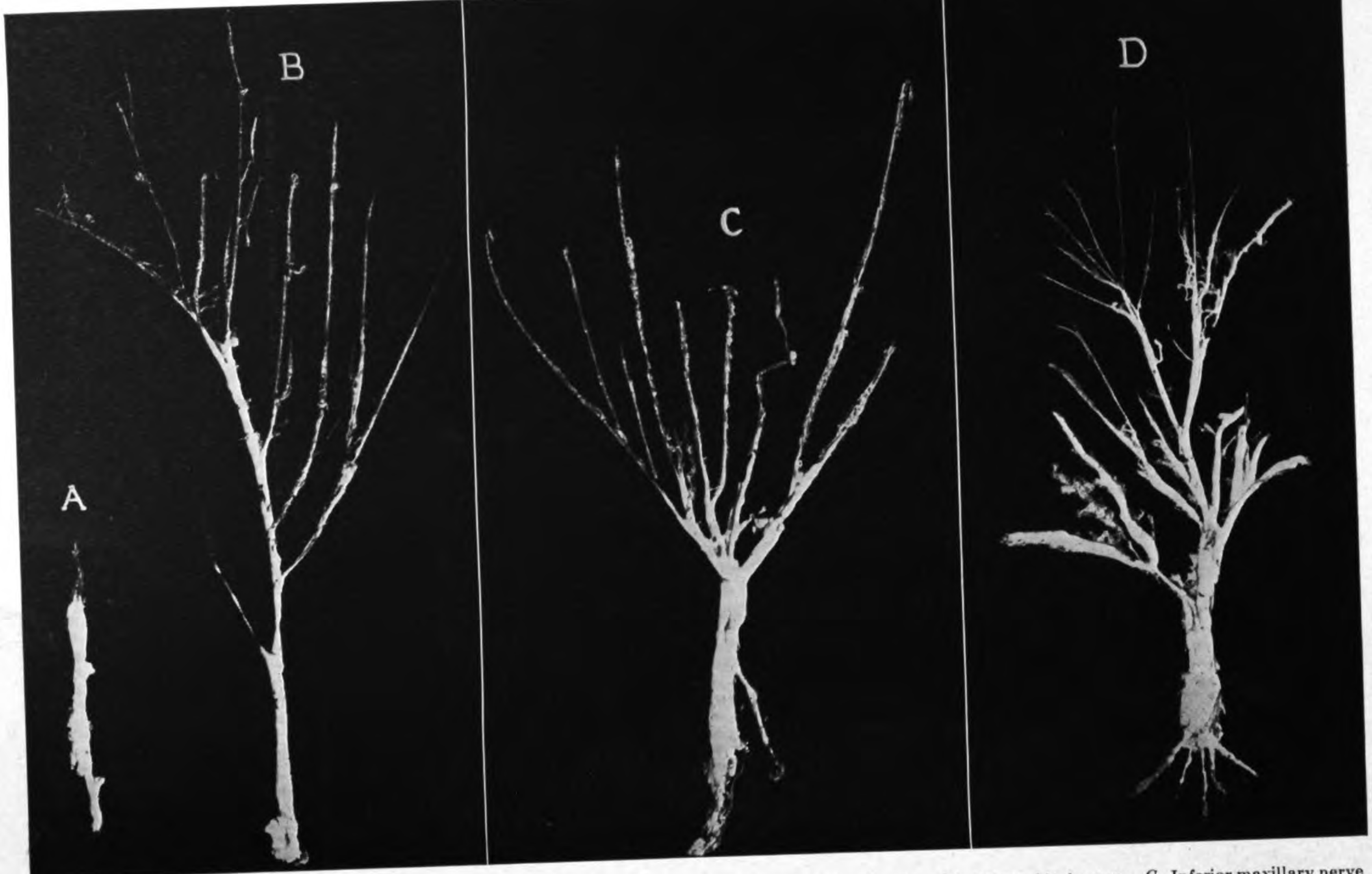
In certain cases the pain remains, or is even increased, for one or two days after the avulsion of the nerve. This occurs more frequently in those of long standing and is analogous to the pain that is sometimes referred to a foot or other member that has been amputated. It is due to the traumatized end of the remaining portion of the nerve and is in keeping with a recognized rule that in an irritation of a nerve the pain is referred to its point of distribution. It has been noticed that in cases where there is severe pain in one division and slight pain in another the removal of the nerve with the greater pain will be attended with the disappearance of the pain in the other affected division.

As a preliminary to the administration of the ether, one-sixth of a grain of morphine and one one-hundredth of a grain of atropine are given about twenty minutes before the anæsthetic. The most serviceable arrangement for anæsthetizing is the Junker apparatus, using a catheter instead of the mask. The catheter is introduced into the nose just beyond the posterior nares and held in place by means of a strip of adhesive plaster fastened to the cheek, leaving the field of operation clear. The air by passing through the ether becomes saturated and the mixture of air and ether is forced into the posterior part of the mouth and pharynx.

Incisions for the supra-orbital and infra-orbital as well as for the mental nerve need never be more than a half to three-quarters of an inch in length. Any additional room that may be needed can readily be acquired through retraction. It is important to free the nerves of all surrounding structures and for a sufficient distance in order to secure a good grasp with the forceps. The avulsion should be conducted slowly, giving about ten to fifteen minutes to each nerve. It can be carried out with ordinary forceps, the blades of which are covered with rubber tubing. The forceps introduced by Krause for this purpose are constructed with one concave and one convex or rather rounded blade, which insures a firm grasp on the nerve.

Fig. 3.

A. Auriculotemporal nerve. *B*. Orbital nerve *C*. Infra-orbita nerve. (Natural size.)



A. Inferior maxillary nerve, section removed through trephine opening at the junction of the body and ramus. *B*. Infra-orbital nerve. *C*. Inferior maxillary nerve section removed at the mental foramen. *D* Infra-orbital nerve. (Natural size.)

Plugging the foramen with silver screws and other foreign substances has been recommended. The efficacy of this procedure is doubtful, as experience has shown that in time the screws become loose through pressure atrophy, sometimes becoming dislocated and even permitting the nerve to extrude itself through the space between the screw and the side of the foramen.

In the avulsion of the supra-orbital, the eyebrow is shaven and the incision made within the hair line. The intention is to have the middle of the incision correspond with the supra-orbital notch. After division of the skin and the orbicularis muscle the superficial fibres are carefully sought for as a guide to the deeper portion of the nerve, which is generally found in the orbital periosteum or between the latter and the orbital plate. It is seized as far back as possible beyond the origin of the supratrochlear branch and slowly avulsed. If the separation of the artery from the nerve is not feasible, they are twisted out together. In separating the periosteum from the orbit, it is important to avoid tearing the same, as this allows the orbital fat to protrude and interfere with the free exposure of the nerve.

In the avulsion of the infra-orbital nerve, the incision is made parallel with and just below the lower border of the orbit, and, as in the supra-orbital, the foramen marks the centre of the incision. A line dropped vertically downward from the supra-orbital foramen to a point between the two bicuspid teeth will touch the supra-orbital, the infra-orbital, and the mental foramen. The nerve emerges in the upper part of the canine fossa beneath the levator labii superioris. Some operators separate the periosteum from the floor of the orbit and with a chisel and hammer break through the plate of bone that completes the infra-orbital canal and the rim of the orbit that overlies the infra-orbital foramen and lift the nerve out of its groove, grasping it as far back in the orbit as possible.

The orbital nerve can easily be reached at the extero-inferior region of the orbit. An incision three-fourths of an inch in length is made along the outer wall of the orbit, terminating at the inferior boundary. The skin and orbicularis are divided and the periosteum separated from the outer orbital wall until the nerve comes into view in its passage towards the foramen in the malar bone.

The auriculotemporal nerve can be reached by vertical incision paralleling the temporal artery. An incision of half an inch

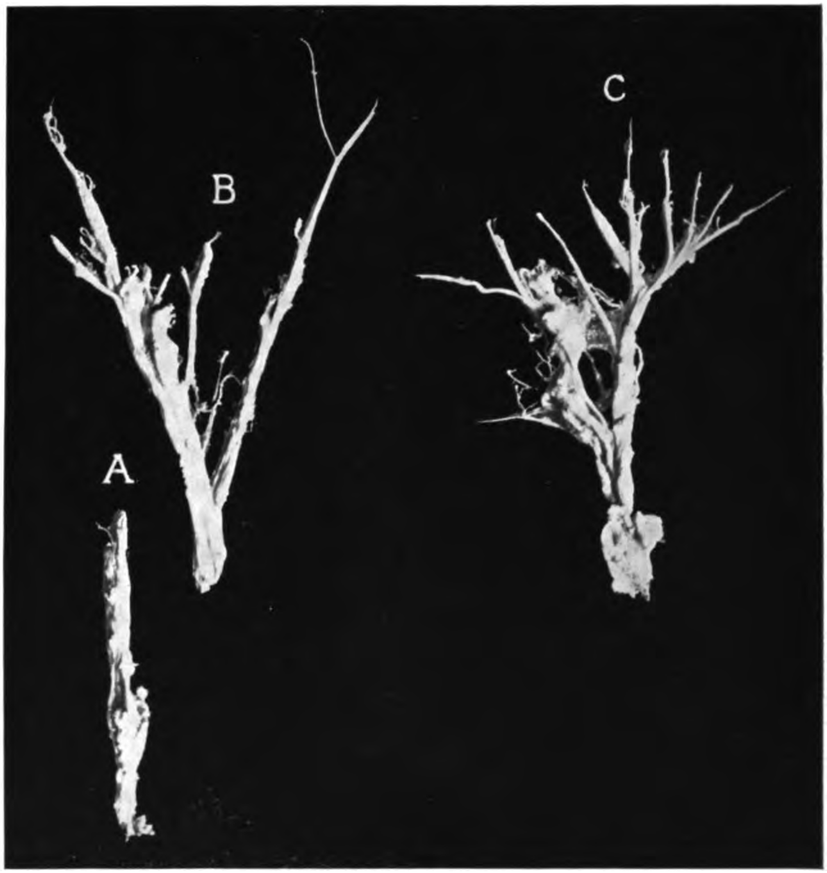
through the skin and fascia terminating at the root of the zygoma will suffice. The artery is the guide, and just behind this is found the nerve.

In reaching the inferior dental nerve a curved incision of an inch and a half to two inches is made around the angle of the lower jaw and just behind the bone. It is desirable to arrange so as to have the angle of the jaw correspond with the centre of the incision and to place the latter behind and below the bone for cosmetic reasons, as well as to avoid some of the lower fibres of the facial nerve. The edge of the bone is exposed and the tendinous attachment of the masseter pushed upward with a periosteal elevator. A small trephine (half an inch) is preferable to the chisel for exposure of the inferior dental canal. A point midway between the convexity of the angle and the concavity just opposite, *e.g.*, the concavity that marks the junction of the ramus and body at the upper border, will expose all or enough of the inferior dental canal to reach the nerve. This is drawn out and avulsed. It is not necessary to restore the button of bone, and the wound in this, as in the other instances, is closed without drainage by means of a subcuticular stitch. Frequently there exists for a few days a slight facial paralysis confined to the lower part of the face and due to the retraction of the wound.

After the removal of the inferior dental nerve posteriorly the remaining portion can be extracted at the mental foramen. An incision of half an inch through the mucous membrane opposite the bicuspid teeth readily exposes the mental foramen with the mental nerve emerging. This is firmly grasped and slowly avulsed.

The variety of operations and their modifications that have been suggested for the removal of a portion or all of the second and third divisions of the fifth nerve are numerous. Only those methods have been mentioned here that I have found from experience upon the living and dead subjects to be the best for the purpose.

Fig. 5



A. Inferior maxillaiy nerve, removed through trephine opening at the junction of the ramus and body. *B*. Inferior maxillary nerve, section removed at the mental foramen. *C*. Infra-orbital nerve.

SIMPLIFYING THE OPERATION FOR THE RADICAL CURE OF INGUINAL HERNIA

BY ASPINWALL JUDD, M.D.
Adjunct Professor of Surgery, Post-graduate Medical School and Hospital, New York City

So MUCH has been written on hernia and so many operations have been described for the cure of this condition that it seems, at first glance, practically impossible, at this late day, to add anything to the mass of existent literature upon this subject. Many of these operations are more or less effectual, and one, the Bassini, is a classic. My effort in this paper will not be to popularize a new operation, but to endeavor to clear away more or less, as it seems to me, unnecessary description and to embody modifications, a few of which are my own.

I have found in my teaching of surgery that of all the operative work the subject of inguinal hernia seems to be most confused in the minds of the students. It is on account of the numerous questions that have been asked me that I have undertaken to clarify, and possibly simplify, in the mind of the infrequent operator the details of what should be not a difficult operation.

Of course, it is impossible in the scope of this article to describe and give the details of the various procedures which have been devised to meet the many complications which arise in this condition. They are protean and, indeed, almost as frequent as the individual cases. Granted, however, an ordinary amount of mechanical common sense in meeting these emergencies, with the below-described operation as a foundation to build upon, the average operator will succeed in producing a good, sound, abdominal wall.

THE OPERATION

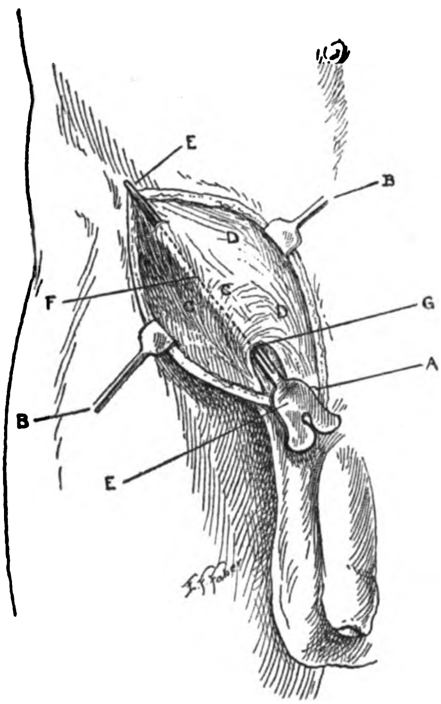
As the keystone upon which our operation rests is the spine of the pubis; its recognition is essential. (Fig. 1.) An incision two and one-half inches in length is made, beginning just above the spine of the pubis and extending upward and outward parallel with Poupart's ligament and one and one-half inches internal to the same.

This incision extends through the skin and fat to the superficial fascia. It is advisable at this point to thoroughly clear this fascia for an inch on either side of the incision. This is done by means of gauze. So far as possible in operating for hernia, the hands of the operator should come in contact with the wound as little as possible, sterile gauze and instruments being used wherever practical.

The emergence of the cord from the external ring is next determined. This will be found shortly above and external to the spine of the pubis (Fig. 1, *A*). A grooved director is now inserted directly beneath the fascia and pushed forward parallel with its fibres to the upper angle of the wound (Fig. 1, *E*). Care should be taken not to include the deeper structures. The fascia is split with a knife or sharp-pointed, straight scissors. A hæmostat is firmly clamped upon the edge of the divided fascia (Fig. 2, *C C* and *D D*), both external and internal, at the inferior and near the superior angles of this incision. The operator next grasps the two internal clamps with his left hand, drawing them upward firmly, and strips the muscle from the fascia, not the fascia from the muscle, as in the latter case he would be apt to tear the fibres if the fascia is weak, as it often is in hernia cases. The muscle is stripped away from the fascia until the crescentic-shaped, conjoined tendon comes clearly into view for its full length down to its insertion into the spine of the pubis (Fig. 2, *E*). The external portion of the fascia is now grasped with the left hand by means of the hæmostat, and the muscle is stripped in exactly the same manner until Poupart's ligament (Fig. 2, *F*) is thoroughly cleared down to its insertion into the spine of the pubis, and also the insertion of Gimbernat's ligament (which is only the floor of Poupart's ligament) at the same point. This is an important feature of the operation. The cord and sac is next separated from its attachment to surrounding structures on a level with the spine, and while being held with the forefinger of the left hand surrounding it, or preferably by gauze, by means of a blunt-pointed instrument or sterile gauze, it is stripped upward to the level of the internal ring. This stripping must be thoroughly accomplished, especially upon the superior surface. The necessity is not usually sufficiently emphasized of isolating, if it is discovered, the ilio-inguinal nerve and placing it out of harm's way when we insert our first layer of sutures (Fig. 3, *G*). A point here that I find confus-

ing to the average student is to define and clear away the fibres of the intercolumnar fascia or cremasteric muscle, which frequently comes down upon and very closely adheres to the structures of the cord and sac and upon its superior surface. Where this is very adherent, it is wiser to carefully incise with a sharp instrument than

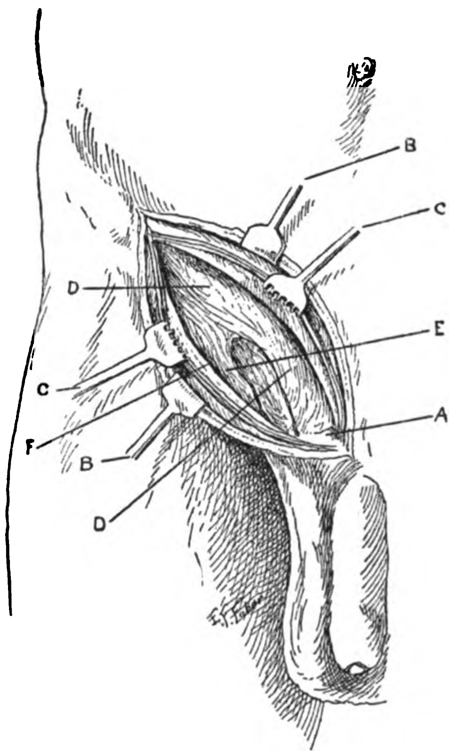
FIG. 1.



First step.

A, Spine of pubis.
BB, Cut retracted edge of skin.
CC, Superficial fascia.
D, Conjoined tendon.
E, Grooved director.
F, Line of incision in superficial fascia.
G, External ring.

FIG. 2.



Second step.

A, Spine of pubis.
BB, Cut retracted skin.
CC, Superficial fascia retracted.
DD, Conjoined tendon.
E, Poupart's ligament.

to endeavor to tear away, as by the latter procedure we are apt to wound the veins of the cord or tear the sac if it is fragile. When this has been properly accomplished, the crescentic-shaped, internal ring stands out clearly defined and the cord is ready for transplanting.

In stripping away our adherent tissue on the inferior, or, if you

like, posterior surface, care must be taken not to wound the deep epigastric vein and artery or its branches (Fig. 3, *H*), which frequently are large and cross the peritoneum at the level of the ring. Where we find, as not infrequently happens, an indirect hernia complicated by a direct one, it is wiser to divide these vessels, both vein and artery, having first secured each between two ligatures, thus making one sac out of the direct and the indirect hernia. Where our hernia is not scrotal, it is unnecessary to strip our structures from the cord below the spine of the pubis; but if we find the scrotal variety with a large, tough sac, it then becomes necessary to strip down and isolate the sac even as far as the testicle. Where, however, the tunica vaginalis is very thin and fragile, it is wiser to tie and cut it off at a level with the spine.

We now have before us the structures of the cord, including the sac, with our canal, including the internal ring, thoroughly exposed and defined. If our hernia is of the indirect variety, we will always find our sac upon its anterior surface; if of the direct variety, posterior to the cord. This is a simple and sure method of determining an indirect from a direct hernia.

The treatment of a direct hernia is very simple. It is seldom closely adherent to the cord, and its treatment depends upon its size. It is not often a clearly defined sac, usually a convex bulging of the peritoneum of greater or less extent. If large or if omentum or gut is adherent, it should be split longitudinally, that is, parallel to the direction of the cord, and the redundant portion removed by sewing it up in the same manner as we treat a peritoneal incision in any other part of the abdomen. If not of great extent, a purse-string suture, which when drawn together inverts the redundant portion, is quite sufficient. Where we meet with only a simple bulging of the peritoneum, it requires no treatment. A point which is often lost sight of is that the bladder is sometimes adherent or presents at the lower angle of a direct hernia, and great care should be exercised in treating the sac that we do not puncture or incorporate the bladder in our stitches.

To return to the indirect variety. By grasping the structures of the cord upon the outstretched fingers of our left hand, the cord will usually be distinguished by its white appearance. When this fails, a grooved director or other blunt instrument is inserted at the lower

portion of the cord, care being taken not to wound the vas deferens, which is easily distinguished by its hard, cord-like feel, or the veins of the cord which run parallel to it. The blunt instrument then runs along parallel with these structures, stripping the tissues layer by layer up to the internal ring. In case these are tough and adherent, gentle snipping with curved, blunt-pointed scissors is a far better procedure than exerting too much force in tearing. When the sac is found, the edge of it is clamped with a hæmostat and it is stripped clear from the cord. We often here resort to snipping rather than exert undue force. A further detail should be emphasized. It is essential that the edges of the sac should be thoroughly cleared from the internal ring. The sac is now opened by a small incision, and the finger of the operator, placed within, determines whether we have adherent omentum or gut. If this be not the case, a purse-string suture of plain No. 1 catgut is inserted, and while the operator's finger remains in place to prevent the descent of gut or omentum, an assistant gently tightens the ligature. At the last moment the operator's finger is withdrawn. Where the ring is not large, the excess of the sac is cut off and the stump is dropped back into the peritoneal cavity. Where the ring is large and the sac is large and thick, a modification credited to MacEwen is recommended. This consists in plicating the sac, inserting one finger into the ring at its superior portion, and with a large, curved needle carried along the finger bringing our catgut suture out through the muscle about one and one-half inches above its lower border. When we pull upon this, we will find that our pad, which consists of the plicated sac, is carried up into the ring and partially or completely plugs it. This is then tied loosely, so as not to strangulate the muscle. Nature forms adhesions at this point in a short time, and considerable strength is added to the operation by this procedure. Where the gut is adherent to the sac, of course, it must be carefully separated, being careful not to denude it of its peritoneal covering. Adherent omentum is separated in the same manner. Where we have a large mass of omentum, it is wiser, as a rule, to resect the redundant portion, as its replacement causes a considerable increase in interabdominal pressure, which, at the least, is decidedly uncomfortable to the patient and often results in untoward symptoms. Where the veins of the cord are much enlarged or excessive in number, it is wiser to resect

them, leaving only sufficient for the proper nourishment of the testicle.

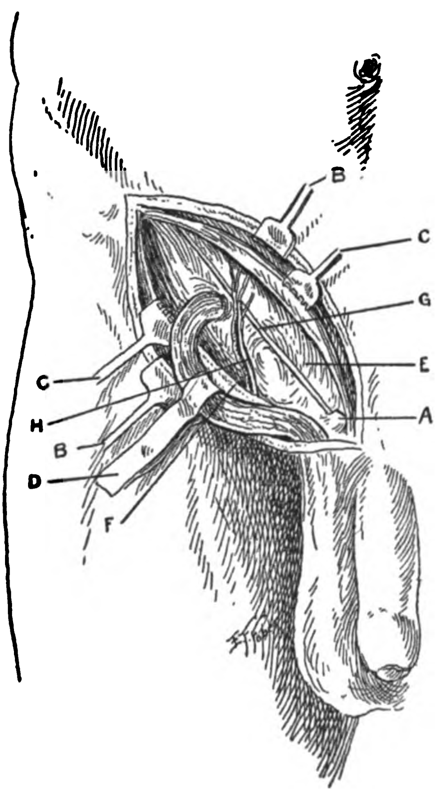
The cord is now brought out of the wound, being held out of the way by placing it external to the clamps which we have placed upon the outer portion of our external fascia (Fig. 2, *B B*).

The suture material which I use exclusively in hernia operations is kangaroo tendon. This remains in place from forty to sixty days, practically never becomes infected, even if the wound suppurates, and is well borne by the tissues. This is applied by means of a De Garmo needle, which consists of a round, full-curved cervix needle, about three-quarters of an inch in length, with the point filed off. The great advantage claimed by De Garmo for this needle, in which I fully concur, is the impossibility of wounding vessels or deep structures in its use.

Upon the proper insertion of the next few stitches depends our immunity from recurrence. In each stitch a good bite of the conjoined tendon must be secured. No matter how heavy the muscle, it must not be depended upon to properly secure our stitches. In most instances the De Garmo continuous suture, locked as will be below described, is used. Our first stitch is placed in the conjoined tendon as near its insertion to the spine of the pubis as possible, care being taken not to go so deeply as to wound the bladder, which lies directly beneath at this point. Our next puncture is perpendicular and not across our wound and should be inserted into the fascia covering the spine of the pubis (Fig. 4, *J*), pushing the needle close to the periosteum and for a distance of a quarter of an inch. If this stitch is properly applied, our greatest danger of recurrence, which, as is well known, is at the lower angle of the wound, is completely obviated. This suture is now tied firmly, and the next stitch in the conjoined tendon is applied, care being taken at this point also to avoid the bladder. The conjoined tendon and not the whole substance of the muscle is taken in these sutures, the excess of muscular tissue being pushed down behind to present an additional pad. Our external puncture with the needle now includes as much of Gimbernat's ligament as possible and the whole of Poupart's. Our suture is now locked by making a loop of the kangaroo tendon, which is drawn taut until the conjoined tendon is in apposition to Poupart's ligament. In this and the succeeding stitch care must be taken not to wound the iliac

artery or its branches, which in case of an anomalous distribution is frequently very near the surface at this point. After our stitch has been firmly locked, a hæmostat (Fig. 4, *L*) is clamped at right angles

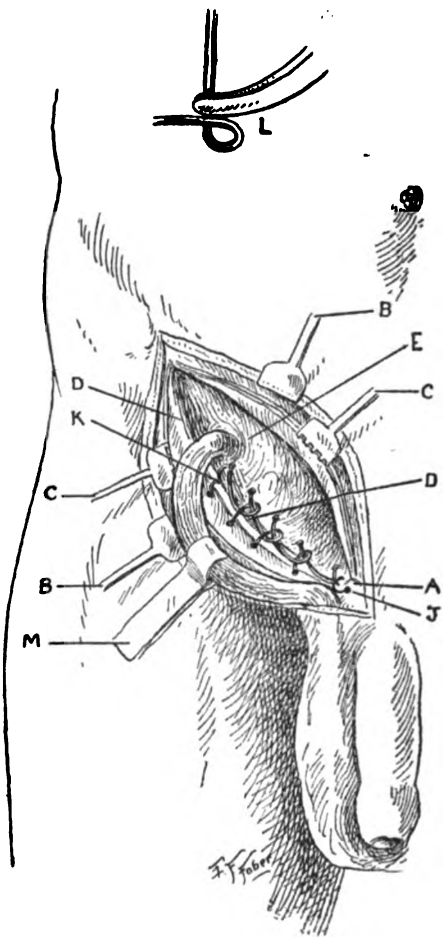
FIG. 3.



Third step.

A, Spine of pubis.
BB, Cut skin retracted.
CC, Superficial fascia retracted.
D, Structures of cord.
E, Conjoined tendon.
F, Poupart's ligament.
G, Ilio-inguinal nerve
H, Branches of epigastric vessels.

FIG. 4.



Fourth step.

A, Spine of pubis.
BB, Cut skin retracted.
CC, Superficial fascia retracted.
DD, Poupart's ligament.
E, Conjoined tendon.
J, First suture, at spine of pubis.
K, Last suture, below exit of cord.
M, Cord.

to the fibres of the tendon. This can not be done with any other suture material than kangaroo tendon, as it cuts the suture. Our

next stitch is applied superiorly three-eighths of an inch through the conjoined tendon on the inner side, and on the outer side through Poupart's ligament, taking in the entire portion of Poupart's ligament from the natural shelf which is described in all operations. This is locked in the manner already described, the hæmostat being removed from the first locked stitch and applied to the second. Thereafter our stitches are applied each one-quarter to three-eighths of an inch above the preceding one, taking the conjoined tendon upon the inner side and the entire substance of Poupart's ligament from the shelf to its outer edge, each stitch being firmly locked. When we come to our last stitch, near the internal ring, we will find that our conjoined tendon is at this point at so great a distance that without exerting undue tension it is impossible to bring it into apposition with Poupart's ligament. As the danger of recurrence is extremely small and as the muscle is usually very thoroughly developed, this last stitch can be taken through the fibres of the muscle on the inner side and through Poupart's ligament on the outer side (Fig. 4, *K*). The suture is now thoroughly secured. The cord at this point has been held well up out of the way to avoid wounding any of its structures.

Having convinced ourselves that we have a sound, firm layer of tissue, we now place our cord upon the bed prepared for it and are ready for our second layer of sutures. The success of an operation for inguinal hernia depends upon the strength and care with which the first layer of sutures has been applied. The second layer of sutures only indirectly aids us, its chief use being for the purpose of protecting the cord. I am often asked if there is not danger of strangulating the cord at the upper angle of our first layer of sutures. This is practically impossible. Where strangulation of the cord occurs, it is due to a pinching between the pubis and the superficial fascia by drawing the fascia too tightly over the cord at the lower angle. It is, therefore, essential that this lower stitch allow the cord sufficient room. This can be determined by inserting a hæmostat beside the cord and finding out if we have sufficient room at this point. Our second layer of sutures consists of ten-day chromic gut, No. 2, and of an over-and-over suture uniting the internal edge of the cut superficial fascia to the edge of Poupart's ligament, or, where we are unable to secure this, by slipping our needle carefully under the loop of our first layer of sutures. This is not at all a difficult

procedure, and nature forms adhesions within a short time which hold the structures firmly in place.

My reason for discarding the older method of utilizing a portion of Poupart's ligament, or, rather, the external cut edge of the superficial fascia for my second layer of sutures, is that Poupart's ligament is often friable and its fibres split, which weakens our first row of sutures materially. By utilizing the whole of Poupart's ligament, this is obviated, and our second row of sutures is applied with as great facility as in the older method.

The skin is now sutured by the subcuticular or any other method desired.

In the old days we were accustomed to keep our patients upon their backs for twenty-one days. This length of time has gradually been reduced until the majority of men keep their patients in bed from twelve to fourteen days. In uncomplicated cases with a sound abdominal wall and with primary union I have found that ten days in bed is amply sufficient.

My percentage of recurrence by the method already described has been so slight as to be negligible. Of course, there are a certain number of cases with friable, rotten fascial planes in whom no method so far devised has been efficient in preventing recurrence. In these cases I think it wise to apply the silver screen described and used by Dr. Willy Meyer extensively. This has given me very satisfactory results in this class of cases. It will be observed that in applying my first row of sutures I begin at the lower angle of the wound, for the reasons, first, that our important structures, bladder and vessels, are at this point; and, second, that our greatest danger of recurrence is also here, and that by so beginning we are able to discern clearly the dangers and have a clear field for operation.

Diseases of the Ear

THE MANAGEMENT OF THE POST-OPERATIVE PERIOD OF MASTOIDITIS[1]

A CLINICAL LECTURE

BY SAMUEL J. KOPETZKY, M.D.

NEW YORK, N. Y.

Visiting Otologist New York Red Cross Hospital; Surgeon (Ear Department) New York Nose, Throat, and Lung Hospital; Assistant Surgeon (Ear Department) Manhattan Eye, Ear, and Throat Hospital

THE importance of the proper management of the post-operative state in mastoditis cannot well be overestimated; for here, certainly, as perhaps in no other branch of modern surgery, the after-treatment is almost as important as the operation itself. All too frequently cases are seen in which the good intended by a most promising operation is entirely undone by the faulty handling of the after-attendant. Week after week added to the already too long lost time of the patient, ugly deformities that ought never to have been allowed, unnecessary and easily avoidable reinfection of the wound, and often the necessity of a secondary mastoid operation are only a few of the dire results that have followed a lack of proper post-operative care. In presenting this paper it is believed that if some such treatment as is here outlined is followed, then all the good of the mastoid operation will be assured, whether that treatment is in the hands of the supposedly less experienced general practitioner or the unquestionably more experienced specialist.

For the sake of clearness we will divide all cases of post-operative mastoiditis into two groups and designate them as non-complicated and complicated cases.

[1] The first paper by Dr. Kopetzky is entitled, "The Management of the Preoperative Stage of Acute Mastoiditis by General Practitioners," and is to be found in the INTERNATIONAL CLINICS, series xxi, volume iii, page 194.

NON-COMPLICATED CASES

In the after-treatment of the uncomplicated cases one of three procedures is applicable: (1) the primary blood-clot treatment; (2) the open method; and (3) the secondary blood-clot treatment.

The Primary Blood-Clot Treatment.—In the primary blood-clot after-treatment the mastoid cavity is permitted to fill with blood and the skin and periosteum are sutured into position, closing the postauricular wound entirely. This has sometimes been modified by placing a small drain of silkworm gut in the lower angle of the wound.

The external auditory canal is lightly tamponed and the external dressings applied. The external dressings are removed daily and the wound surface inspected, so that at the first untoward sign it may be reopened, in which eventuality it is thereafter handled by the open method, of which we will speak later. The patient is kept in bed, watched for temperature elevations, and, everything proceeding smoothly, has entirely recovered at the end of ten days.

For this method of treatment it is claimed that the patient is spared the frequent annoying changes of dressings, and that the entire post-operative period is surprisingly shortened. Furthermore, the cosmetic results are much better usually than with the employment of the open method. Reinfection is also avoided.

Unfortunately this smooth outcome has not usually been obtained by me, and a brief consideration of the factors entering into the procedure will suffice to explain the reasons for the failures.

In middle-ear suppuration, where the mastoid has been involved and a virulent suppuration is present in the tympanic cavity, the aditus, and the mastoid antrum, it seems to me that the closure of the postauricular wound and the organization of the blood-clot defeat one of the purposes of the operation by preventing drainage of the middle ear from behind during its subsequent suppuration. The blood-clot treatment precludes making a counter-opening. The pool of blood within the excavation may have inherent in itself bactericidal properties, but it would appear more likely that this blood will receive an inoculation of bacteria from the exudate draining into it from the tympanic cavity, and the clot will become infected. This is exactly what has happened in the majority of the cases where I have tried this method.

The Open Method.—This is the usual method of treatment. The patient is put to bed and efforts are at once instituted to combat shock and ameliorate the after-effects of the anæsthetic.

Repeated small doses of hot water will relieve the nausea and vomiting due to the anæsthetic, and in extremely nervous and highly sensitive individuals the administration of morphine hypodermically will often ease the first day following the operation.

In cases evidencing sepsis the Murphy drip is of advantage. Large doses of urotropin (gr. x), combined with benzoate of soda (gr. x), every two hours, have also been extremely useful. I refer to cases with symptoms of sepsis already present before operation.

The outer dressings may be changed daily, but the wound-packing should be left undisturbed for from four to eight days.

If no fever develops, and the post-operative temperature remains within safe bounds—for details see below—and the patient has neither pain nor headache, then the dressings should be left intact until the mastoid wound begins to secrete. This wound secretion usually appears between the fourth and the eighth days, varying individually.

If an unpleasant odor is perceptible from the dressings, or if pain is complained of, or if an unaccountable rise of temperature is noted, the wound should immediately be inspected after a complete removal of all packing from it.

At all changes of dressings strict surgical asepsis should prevail, and every piece of gauze, each instrument, as well as the attendant's hands, should be as rigorously prepared as though for the operation itself.

At the first dressing the wound-edges should look fresh, the granulations should be red, of firm consistency, and the gauze packing upon its removal should be only moistened, and not soaked, with secretions. The gauze drain in the external auditory canal should be only damp. These findings at the first dressing change bespeak favorable progress.

The wound is again packed, and after cleansing a drain is again placed in the external auditory canal, and the external dressings applied.

The second dressing is undertaken in three or four days; thereafter usually every second day until healing is completed.

With the exception of old people, who may be permitted to sit up as early as their strength will allow, the patient is kept in bed for the first week. Those advanced in years are usually too easily enervated, and the reaction of their tissues is impeded by a too prolonged rest in bed. In the very corpulent, or those in whom bed rest aggravates pulmonary stasis, the semi-recumbent position is allowed upon the third day.

Healing by granulation should be permitted without interruption, and in a clean, healthy, granulating wound there is no indication for repeated application of antiseptics. The less these latter are employed the more rapidly does healing take place. So long as pus, coming from the middle ear, is in evidence, so long must the antrum be kept open. As soon as the secretions from this region have stopped the closure of the antral space may be encouraged.

The wound tamponade should be as loose as is consistent with maintaining it open for the requisite length of time. Many a post-operative period has been unduly protracted because of a tight tamponade.

As the post-operative period advances, the edges of the cutaneous wound show a tendency to turn inward, which if permitted to proceed unchecked will eventually result in an ugly depressed scar. To prevent this, the skin edges must be carefully separated from the underlying tissue as soon as this tendency is noted, a little manœuvre which is easily carried out under cocaine anæsthesia.

During the early part of this period the study of pulse, respiration, and temperature is important. Following simple mastoidectomy, a distinct febrile reaction is usually observed during the first forty-eight hours. Fever is generally more marked when the operation is of long duration, and is accounted for by assuming absorption of broken-down detritus from the wound edges. Barring other symptoms, post-operative temperature is without special significance. It demands a more frequent change of dressings. When fever is present before operation, it falls immediately thereafter, occasionally rising again on the second day. A second recurrence after a fall is to be regarded suspiciously, especially if the second elevation equals in height the first rise of temperature. A sudden rise of temperature on the third day is not to be lightly considered. Bowels, lungs, and wound then should carefully be examined, espe-

cially if the patient is at all restless or appears uncomfortable. In young children the temperature reactions are more marked than in adults, and the gastro-intestinal tract will more often demand attention.

The Secondary Blood-Clot Treatment.—Under happy circumstances the healing of the mastoid usually takes place in from six to eight weeks. Sometimes, for no reasons that I have been able to recognize, it takes much longer, and there may be conditions present which would make it desirable to shorten this period appreciably. (This long-drawn-out after-treatment is a factor to be considered most seriously among business and professional people.)

With this end in view, Dr. R. Johnson Held and I have conceived the idea of using a late blood-clot treatment. When the case has reached the stage where there is no further suppuration in the tympanic cavity, and the antral opening is about ready to close, usually from at the end of two weeks to one month, we again put the patient under general anæsthesia, and lightly curette the remaining mastoid wound cavity and freshen the wound surfaces of the skin. Then, permitting the cavity to fill with blood, we close the skin wound entirely. The cosmetic results are excellent. The possibility of an infection of the blood-clot from a suppurating middle-ear cavity, as in the primary blood-clot method, is removed, because there is no suppuration present at this time, and we shorten the after-treatment from two weeks to two months. We have seen no late after-effects which in any way can be counted as against the procedure. In my hands it has given uniformly good results.

COMPLICATED CASES

The complicated cases may in turn be classified as to the seriousness or non-seriousness of their condition, and so may be named as the serious or non-serious complications of post-operative mastoiditis.

Non-Serious Complications.—This class of complications, of which we will speak first, have mostly to do with the wound itself, and are of importance only in that they retard recovery and demand of the surgical attendant a greater amount of work. Included among them are excess of temperature, marked dermatitis, stitch and local abscesses, persistent slow-growing granulations, and erysipelas.

In a certain percentage of cases, especially among children, a high degree of post-operative temperature is noted. Where this occurs, and a careful physical examination is negative, and a blood-culture gives a sterile tube, then no especial significance is attached thereto. I have had a case of marked hyperpyrexia, in which the after-treatment proceeded uneventfully otherwise, and in which for four weeks cold sponges and baths were necessary to keep the fever within reasonable limits. Such cases fortunately are not common. In other cases physical examination revealed pneumonias, which from their course and recovery we have come to designate as "ether pneumonias." Meanwhile, in all of these cases the blood count is taken every day, comparisons being made of the polynuclear count and the total leucocytosis, and charted, as described in my first article in this series, which gives reassuring evidences of eventual recovery, or furnishes a sign whereby a serious outcome is foretold. After a reasonable length of time, if the fever begins to take on a curve characteristic of one or other of the complicatory lesions of mastoiditis, other and more vigorous measures are indicated.

The dermatitis so often observed in post-operative mastoid cases is usually caused by iodoform or some other local irritant. It will disappear with the removal of the cause, especially when helped by a wet dressing. Eczemas around the wound edges are best treated by applications of ichthyol in 5 per cent. solution.

Local abscesses sometimes are met with, having their cause in the down-flow of pus from the wound, and are easily cleared up by evacuation and cleansing with a swab of carbolic acid, followed by a free and adequate washing with pure alcohol.

By far the most annoying of the less serious complications is the slow growing granulations, when the open after-treatment is employed. Glazed and almost dry upon their surface, they stubbornly refuse to grow and fill up the wound-cavity, and, after using every means that we know of, we are at times, in sheer desperation, forced to leave the funnel-like opening either to the tender mercies of mother Nature in some way to repair or to be treated by a subsequent plastic procedure. Latterly I have made it a practice, in every case giving evidence of this tendency, to forestall the loss of time and energy, exhausting alike to both patient and surgeon, and have performed a combined plastic with a secondary blood-clot

treatment, and have been uniformly successful in the outcome, securing in this way a prompt recovery and an excellent cosmetic result. Such remedies as the occasional use of iodoform and the free and frequent use of gauze soaked in equal parts of castor oil and balsam of Peru have also been advantageously used in these slow-healing cases.

Excessive granulations, upon the other hand, are very easily met. An occasional clip with a suitably curved pair of scissors, a tighter packing of the gauze in the wound, or, better still, a few liberal touches with a fairly strong solution of silver nitrate, will be all that is required.

The last of these less serious complications, but by far the most important, is erysipelas, which for some unknown reason seems to have a special predilection for the tissues around the mastoid wound. Applications of ichthyol, iodine, and many other remedies have all been advocated, and tried with varying degrees of success. Since the introduction of the use of Hiss's leucocytic extract—a solution of the washed leucocytes of the rabbit—we have found a means which seems almost a specific. This solution is introduced into the tissues by injection, and so fortifies them that the infection is rapidly overcome. In fact, erysipelas has ceased to be considered a grave complication since the work of Hiss and Dwyer gave us this valuable remedy.

Serious Complications.—Under the head of the more serious complications we have space to consider only a few of the more important. These complications should in no sense be looked upon as a result of the mastoid operation, but rather as coexistent or coincident with it, and although done for another purpose, in the real sense, the mastoid operation has been a first step in the relief of the complication itself.

And here I must be permitted to add that this paper is written solely for the guidance of the general practitioner in his care of a post-operative case. It must in no way be regarded as a full dissertation upon the complications here named. The fact is, these complicatory lesions are of so grave a character that even the experienced specialist will often welcome added advice in their management. All we attempt, therefore, is to point out the signs by which they can be more or less easily recognized, and in this way

to put the family attendant in a position whereby he is able to place his patient in the best way of receiving the treatment that his condition demands.

The first, and perhaps the most common, of these serious complications is *meningitis.*

As we have already seen, some rise of temperature for the first two, and at times three or four, days is always present. But when, without any other discoverable cause in heart, lungs, or other ear, your patient runs a persistent temperature of from 102° to 105°, and the blood remains clear of bacteria, and the sensorium becomes clouded, then meningitis is to be suspected. Rigidity of the neck, retraction of the abdomen, "tache cérébrale," and photophobia add certainty to the suspicion. The findings from spinal puncture are also to be considered. It is not my purpose to detail the symptoms of a meningitis. Every practitioner of medicine knows the clinical picture only too well. What is intended, however, is to point out that otitic meningitis is no longer to be considered a complication whose outcome is hopeless. McKernon, Ballance, Körner, Held, and I have succeeded in obtaining a recovery of a certain number of patients affected with meningitis; and it cannot be too strongly urged upon the family attendant *not* to give these cases a hopeless prognosis and permit them to die without a trial of some of the newer surgical procedures, which already, in the hands of a few men, have given encouraging results.

We have considered meningitis first because the lesions hereinafter to be discussed almost always result in a meningitis as the terminal condition, and sometimes it is found coexisting with them.

The second complication is *sinus thrombosis.* If during the operation in the mastoid process areas of necrosis are found at any point along the sinus walls, and then during the after-period there ensue chills, profound sweats, followed by a quick rise of temperature to anywhere from 102° to 105°, this symptom-complex, regular as to its certainty of repetition, but irregular as to the hour of its arrival and recurrence, whether the laboratory substantiates your decision or not, is indicative of sinus thrombosis.

Additional data are obtainable from the laboratory. The examination of the blood in culture to find growth of bacteria is extremely valuable. Where a positive finding of streptococci is

made in a case with clinical evidence as described above, invariably there is present a septic thrombus in some part of the lateral sinus or jugular bulb. In the face of negative findings with the positive clinical picture, the probabilities are that a thrombus is present. For reasons which space forbids our discussing in detail, a thrombus may be present, yet give a negative blood-culture. Those interested in following this subject further should consult the published works of Libman, Duel and Jonathan Wright, Oppenheimer, and Gruening.

In taking the blood for this examination, every aseptic precaution to guard against extraneous contamination is necessary. The method I employ is briefly as follows:

The median basilic vein is chosen, a tourniquet is applied above to shut off the venous blood-stream. The arm is sterilized as for operation, and when all is ready a rather large-calibre needle is introduced into the vein, pointing upward, and the blood drawn into the attached syringe (Fig. 1). The needle is then withdrawn, and a small sterile pad placed over the area.

In small children the same procedure is performed, only a vein on the dorsal side of the foot is chosen, as the basilic vein is too small for our purpose in these patients.

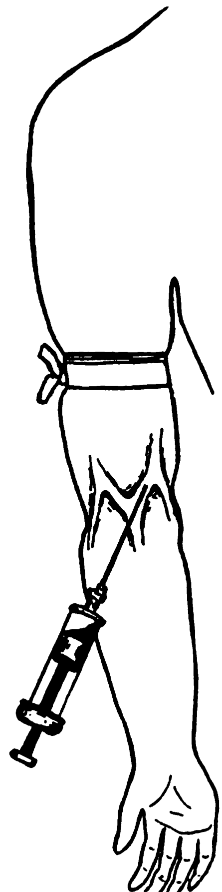
The diagnosis of sinus thrombosis once made indicates that surgical procedures should at once be undertaken to evacuate the thrombus. And the sooner the infected area is cleansed of its offending material, the better the chances of the ultimate recovery of the patient. When diagnosis is made late, the patients are generally profoundly septic, which makes the prognosis less hopeful. The importance of early diagnosis and early intervention is apparent, and in the latter instance recovery is the usual outcome.

After the removal of the thrombus, active measures to combat sepsis should be at once undertaken. Stimulants and sustaining diet must be given. In our hands the injection of Hiss's leucocytic extract, alone or in combination with large doses of urotropin, 200 grains a day in adults, has worked very advantageously. A blood-culture two days subsequent to operation should prove negative. This increases the probabilities of a happy outcome of the condition. The methods of surgical procedure do not come within the scope of this article and will not be discussed.

We now come to the question of *brain abscesses*. Here the

picture of septic absorption is added to that produced by brain pressure. In the early stages nothing of characteristic import is noted. Later, it will be observed that respiration is slow and regular, the pulse is becoming slow and often is bounding, at a rate

FIG. 1.



Method of drawing blood for culture.

from fifty to sixty per minute. The temperature rarely is high; sometimes it remains normal, and often it is subnormal, until the areas around the pus accumulation become involved, the meninges are affected, and headache and meningeal temperature become evident. A projectile style of vomit, bearing no relation whatever

to the condition or contents of the stomach, is significant. As intracranial pressure increases, the pain from the tense dura gives rise to unbearable headache, and optic neuritis is evidenced. The clinical picture here sketched is sufficient for the diagnosis, at which we arrive more quickly when pressure paralyses make their appearance.

In the terminal stage consciousness is clouded and the signs of meningeal involvement supervene. Early surgical interference is the only means to avert the inevitable fatal outcome. The general after-treatment after the evacuation of the abscess is along lines similar to that after removal of septic thrombi.

Fig. 2.

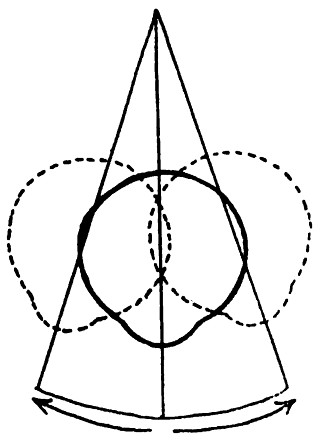


Fig. 3.

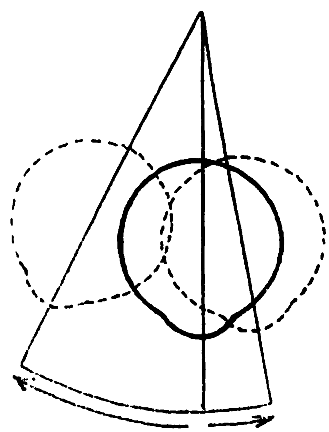


Fig. 2 illustrates the excursion of the eyeball in ocular nystagmus.
Fig. 3 illustrates the excursion of the eyeball in labyrinthine nystagmus.

Finally we will briefly discuss *purulent labyrinth.* While authorities differ as to the frequency with which purulent mastoiditis occurs, some placing it as high as one in every hundred, while others think one in six hundred is more nearly correct, all agree as to the reality of its presence and the possibility of its complicating the post-operative state. Unfortunately, its positive diagnosis is by no manner of means easy, and will tax the ability of the most experienced otologist, and yet so grave is its import that any one who accepts the responsibility of the care of the post-operative mastoid patient ought at least "to know enough to know that he doesn't know," so that when certain conditions or complications arise he shall know enough to seek advice for his patient's good. Apparently,

the only two positive symptoms of this complication (by which we mean symptoms which belong to it alone, and which are not shared in by the complications already discussed) are those of marked loss of hearing (total deafness) and disturbances of coördination, signalized by nystagmus. When, therefore, at any time in the post-operative state this latter symptom becomes manifest, a purulent

FIG. 4.

Method of performing the coloric test of the labyrinth.

labyrinthitis is developing, especially if the temperature curve shows elevation simultaneously.

It is not intended that the differential diagnosis should be made on the data here furnished. It is the object of the writer rather to point out danger signals during the post-operative period, so that when these symptoms develop aid and advice may be sought, for the care of a patient suffering from a purulent labyrinthitis de-

mands the highest degree of special skill to ensure a favorable outcome.

It is not amiss to add a few words regarding *nystagmus.* Nystagmus is an oscillation of the eyeball, varying in different classes of cases. It may be elicited in any position of the eye, or only in extreme abduction. It is a reflex, and in its origin is either ocular, vestibular, or central, and the differentiation of these three is very important.

FIG. 5.

Chair devised by Dr. W. C. Phillips for rotation tests, for estimating the activity of the labyrinth. Patient is placed in the chair and turned 10 times in one direction, suddenly stopped, and the nystagmus noted, and its duration timed.

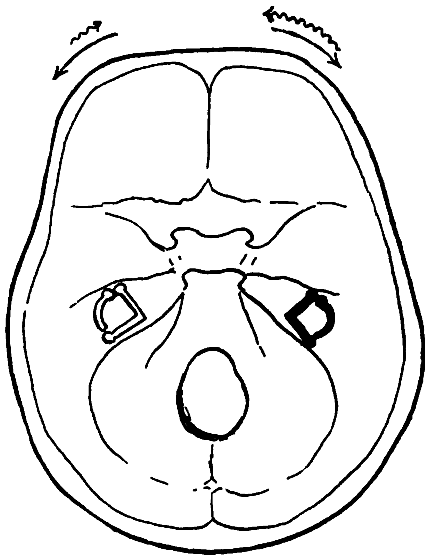
Ocular nystagmus is undulatory, and observable in any position of the eye. The excursion of the eyeball in one direction equals the direction it travels in the opposite direction, both as regards extent and rapidity (Fig. 2).

Vestibular nystagmus is rhythmic and consists of two components: a slow vestibular component, and a rapid cortical movement in the opposite direction (Fig. 3). The nystagmus is named from the direction of its quickest motion. When the vestibular nystagmus is marked, it is observable when the eyeball is placed in

any position. When small in amount, it is best elicited during extreme abduction of the eyeball.

Nystagmus may be spontaneous or it may be induced. When spontaneous, it is a symptom observable at the bedside. Spontaneous vestibular nystagmus is observable only in the beginning stage of the labyrinthitis. After the purulent invasion has destroyed the labyrinth, then this structure does not functuate, and the labyrinth is inactive thereafter. Hence we resort, in cases suspected of being labyrinthitis, to certain tests to determine whether

FIG. 6.



(Rotation of patient to right.) Direction of turning of body and flow of endolymph after rotation has stopped. Direction of nystagmus. Shaded labyrinth is diseased.

or not the labyrinth is still active. The key to the situation lies in trying to induce nystagmus. Normally the labyrinth reacts to a given stimulus by causing a vestibular nystagmus. This stimulus may be heat or cold (caloric) (Fig. 4), the rotation test, or the electrical reaction.

For practical purposes the caloric test is sufficient. We douche the ear with hot or cold water, and within five minutes, in a normally reacting labyrinth, expect to produce vestibular nystagmus. When we fail, and the clinical picture is present, we get a negative

reaction, and consider the labyrinth involved in the disease (Figs. 5 and 6).

In bringing to a close this paper on the management of the post-operative period of mastoiditis, we of course are not unmindful of the very great importance that should be attached to the general physical condition of the patient. But this has been taken for granted. For, if the strong point of the specialist is his more extended and exact knowledge of his specialty, then surely the strength of the general practitioner lies in his more experienced familiarity with the general conditions; and pneumonias, cardiac lesions, diabetes, and kidney disease will often complicate the post-operative period of mastoiditis, and unless these coincidental conditions receive proper management we can scarcely expect the final recovery of our patient.

Obstetrics

SURGICAL ANATOMY OF THE FEMALE PERINEUM

BY WALTER E. TOBIE, M.D.
PORTLAND, MAINE
Professor of Anatomy, Medical School of Maine; Associate Surgeon Maine General Hospital

In the study of human anatomy, the female perineum has not received the attention that its surgical importance warrants. Most text-books make its description secondary to that of the male perineum, emphasizing only the important structural differences. Probably this custom originated at a time when gynæcology was little studied and operations were relatively much more frequently performed on the male perineum than on the female. The character of the dissecting material at the disposal of most medical schools does not conduce to careful study of this region in the female, and the information obtained through surgical familiarity involves only gross consideration of displaced and distorted parts.

It is not advantageous to confine anatomical teaching to strict details of structure. This is particularly true of the study of muscles, an intelligent and useful conception of which can be had only through an intimate knowledge of their function. So important is this knowledge that certain minutiæ of structure may well be omitted in their study, that greater stress be put upon facts relating to their function. In addition to their physiology, it is desirable also to know something of their embryology and comparative anatomy, or, broadly, their morphology.

The human body presents some mechanical defects, among which is the compromise arrangement by which sphincter muscles are made to serve as supports to the pelvic outlet of the female. We are accustomed to think of muscles as acting only on their terminal attachments, known as their origins and insertions. In reality they

do much more than this. By their contractions they alter the relative positions of their origins and insertions and move parts with which they are in contact. As regards muscles forming parts of flexible walls or guarding orifices, this second function is the more important. Such muscles are made up of parallel bundles of muscle fibres massed in sheets or ribbons. The bundles do not extend in straight lines from origin to insertion, but present curves. By the lessening, flattening, or obliteration of these curves they relieve, produce or resist pressure, or close orifices.

Tracing the evolution of the levatores ani, we find that they originally served as abductors and flexors of the tail, pulling in straight lines. In the lower vertebrates two distinct parts exist, known as the iliocaudalis and pubocaudalis. In the human animal these two parts, known as the iliococcygeus and pubococcygeus, are attached to the vestigial tail or coccyx, which has lost its capacity for lateral movement. It may still be flexed, but this motion is important only as it affects structures ventral to it. The levatores ani no longer work alternately to draw the coccyx from the median line, but contract together. Viewed from above they present a concavity, from in front a loop, and by their conjoined contraction the concavity is diminished, thus resisting intrapelvic pressure, and the loop is tightened, thus closing the vaginal outlet. These results are made possible by attachments of the pubococcygei mesially to soft parts ventral to the coccyx, which are the anococcygeal raphe, the sides of the anal canal, the perineal body, and sides of the vagina.

The common conception of sphincteric action is that of a puckering or purse-string closure, and this is true as regards involuntary sphincters. With a single exception (not important in this connection) it is not the manner in which voluntary sphincters act. Mesially placed voluntary sphincters close orifices by a straightening of their curved sides or an approximation of their ends, and exert their greatest force in a single axis instead of distributing it evenly in many axes.

The sphincter ani externus is commonly thought of as an annular arrangement of muscle fibres. It is in reality two muscles, one on each side of the anal canal. Dorsally each muscle has an osseous attachment and may fairly be considered as having a like attachment ventrally, through the prolongations known as the transversi

perinæi superficiales. These last-named muscle slips are described as passing from the tuberosities of the ischia to the central point of the perineum. They are said to steady the perineal body; but for this purpose only a tissue of the sustentacular group would be superior, and actually exists as the base of the triangular ligament reinforced by Colles's fascia. If these weak slips acted as independent muscles they would produce a sidewise movement of the perineal body. There is no evidence that this movement occurs; no occasion for its performance. The presence of these muscular bundles as prolongations of the sphincter ani externus is rational and quite in keeping with the structural plan of other voluntary sphincters.

The last muscle for description is the bulbocavernosus or sphincter vaginæ. This muscle is made up of two bilateral slips, one-half to three-quarters of an inch in depth, applied to the sides of the vulva outside of the bulbs of the vestibule and extending from the perineal body to the pubic bone near the clitoris. It is usually described as being attached to the central point of the perineum and sometimes so pictured, with its halves diverging as they pass forward and then converging to meet again over the clitoris. Other books, while describing it in the same way, picture its component halves as attached dorsally to the perineal body some little distance from the median line. This is the arrangement I have always observed in dissections and have also determined by palpation in the living subject (Fig. 1). The exact mode of the dorsal ending of the fibres varies. At times they mingle with those of the sphincter ani externus. They have been described as being prolonged into the transversi perinæi superficiales. I have observed them frayed out and attached to the base of the triangular ligament. Although the halves of the bulbocavernosus normally pull in straight lines, it will be shown later that this muscle is a sphincter of the vagina, though not the only nor principal one.

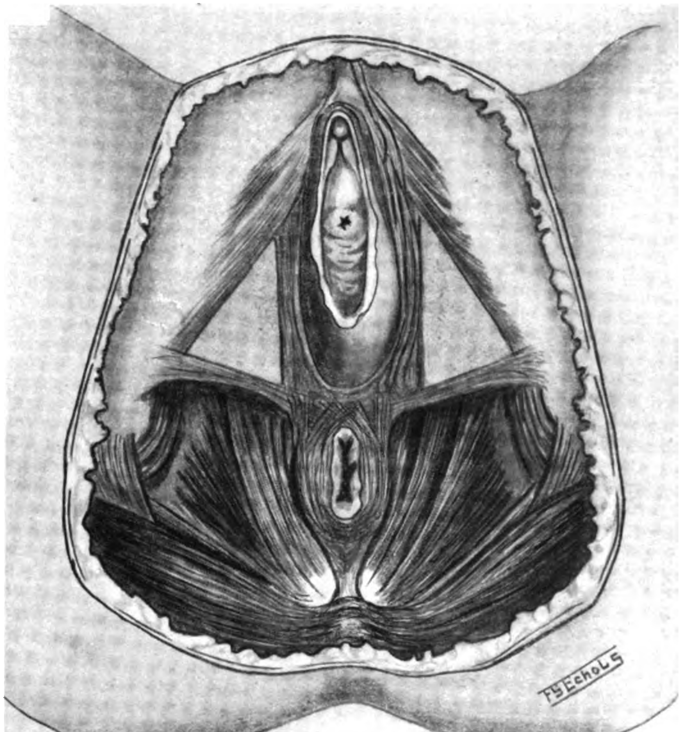
Attention has been called to the fact that voluntary sphincters usually do not produce a purse-string closure, strictly speaking; certainly not to the extent that obtains in the case of involuntary sphincters. The levatores ani acting together tend to draw all of the structures dorsal to the lower part of the vagina forward and somewhat upward. The parts chiefly concerned are the inferior and mesial portions or pubococcygei. They flex the coccyx and draw

ventrally the anus, perineal body, and lower part of the vagina. Thus the dorsal wall of the vagina is brought against the ventral wall, the bladder is supported, and the vaginal canal receives a marked forward sweep or concavity. Considerable effort has been spent by investigators to determine the manner in which the pubococcygei are attached to the perineal body, but practically this is unimportant. A pre-anal attachment exists and the pubococcygei give elastic support to all the perineal structures dorsal to the base of the triangular ligament and draw them forward and slightly upward. They form the chief sphincter of the vagina, may exert a similar action on the anal canal, and are the most important muscles under consideration. Their sphincteric action is exerted mainly in a dorsoventral direction with slight lateral pressure.

In addition to the manifest function of guarding the anal outlet, the sphincter ani externus contributes to vaginal closure and pelvic support. Its ventrolateral prolongations, the transversi perinæi superficiales, are factors; but more important are the virtual continuations ventrally in the fibres of the sphincter vaginæ. This muscle is on the same morphological plane as the sphincter ani externus. Taken together they form a double loop or figure of eight. This double loop extends from the pubic bone, near the clitoris, to the tip of the coccyx dorsal to the attachment of the pubococcygei. Acting together, these muscles draw the coccyx and soft parts ventral to it in the same direction as do the pubococcygei. The part taken in this movement by the ventral loop of the figure of eight entitles it to the name sphincter vaginæ. It has, however, received this title from its power to compress the vaginal outlet laterally, when the mesially directed concavities of its halves are straightened. Probably at its best the movement is important only as it serves to compress the bulbs of the vestibule. It is apparent that lateral constriction of the vaginal outlet must be diminished and may be absent when the dorsal ends of these bands are separated, as is usually the case. They will, however, continue to pull in the line of their fibres and exert pressure similar to that produced by the pubococcygei.

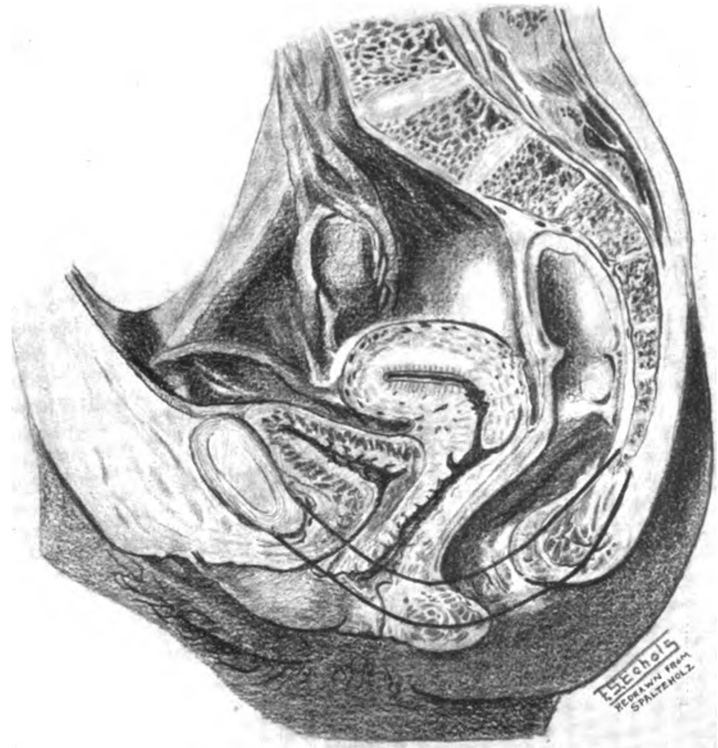
The action of all these muscles contracting together is to produce dorsoventral closure of the pelvic outlet with slight lateral compression, when the component halves of the pubococcygei and sphincter vaginæ diminish any slight mesial concavity that may exist in the

FIG. 1.



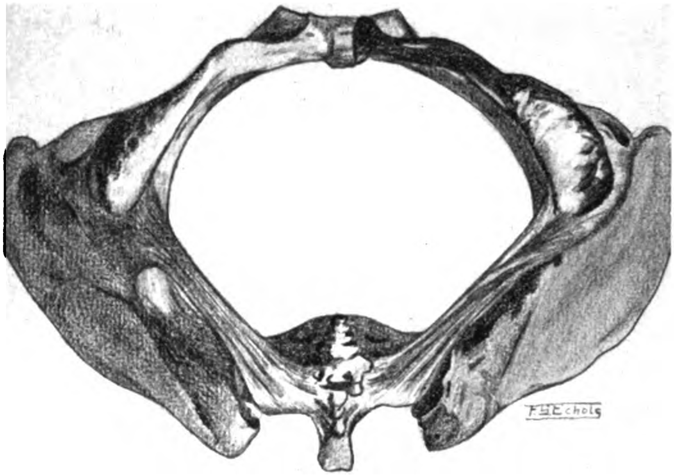
The perineal muscles are shown as they appear when well developed in what is believed to be the typical arrangement. When so arranged it is apparent that the sphincter vaginæ cannot compress the vagina laterally to any appreciable extent.

FIG. 2.



Showing the course of the two nearly parallel, muscular slings. The curve of the superior sling becomes flattened after a perineal laceration. The inferior sling suffers a transverse rupture and its ends retract, as shown by the dorsal displacement of the anus that ensues.

Fig. 3.



The bony and ligamentous pelvic outlet. The ventrolateral sides are rigid. The dorsolateral sides and dorsal angle are capable of yielding.

Fig. 4.

Perineal region of a virgin; labia drawn apart. Attention is called to the normal perineal body, which is short, compact, and rounded.

line of their fibres. Pelvic support and intrapelvic pressure is given largely by the first movement and somewhat by the second, but here a third movement comes into play, involving also the straightening of curved fibres or bundles.

If the inferior and mesial border of the pubococcygeus muscle is traced (Fig. 2) ventrodorsally, it will be observed that it presents to the pelvic aspect a pronounced concavity. Starting at the dorsal surface of the os pubis, it touches the superior layer of the triangular ligament at its base, is in contact with the superior border of the sphincter ani externus, and then is attached to the anococcygeal raphe and the coccyx. Tracing half of the sphincter vaginæ and sphincter ani externus in the same way, a nearly parallel curve is outlined. It touches the pubic bone ventro-inferiorly, rests on the inferior surface of the lower layer of the triangular ligament, enters into the structure of the perineal body, and continues dorsally to become attached to the dorsal surface of the coccyx. The muscles of the two sides contracting together and diminishing this curve produce intrapelvic pressure and resist downward displacement. The normal and constant contraction of all the muscles, known as muscle tone, serves to maintain elastic support and closure by a mechanism that may increase or diminish pressure as necessity arises.

It is not to be understood that muscular tissue is the only histological structure involved in these considerations. Muscles considered as organs include such sheets, bands, or layers of fibrous tissue as are fused with them or to which they are attached. The triangular ligament of the perineum requires special description. The bony and ligamentous pelvic outlet is four-sided (Fig. 3). The subpubic angle and tip of the coccyx represent respectively the ventral and dorsal angles. The lateral angles are placed at the ischial tuberosities. The ventrolateral sides are the ischiopubic rami; the dorsolateral the great sacrosciatic ligaments. In the male, the ventral half of the diamond-shaped space thus formed is closed in by two layers of white fibrous tissue with transversely directed fibres. This double sheet is approximately triangular in outline. Its apex is truncated, it is perforated by the urethra, and the middle of its base is prolonged somewhat dorsally. In the female there is the additional perforation of the vaginal outlet, of such size as to make the triangular ligament less conspicuously triangular on dissection; that is, to

destroy the appearance of a broad triangular sheet. The prolongation of its base meets the ventral end of the sphincter ani externus, thus corresponding to the central point of the perineum in the male. From this point laterally to the tuberosities of the ischia the transversi perinæi superficiales extend, but the dorsal ends of the component halves of the sphincter vaginæ are usually not closely approximated. They thin out somewhat, appear to be attached to the base of the triangular ligament and blend with the structures of the perineal body. In effect the fibres of the sphincter vaginæ prolong the sphincter ani externus ventrally in line with its outer borders. The lower and mesial fibres of the pubococcygei are in contact with the superior layer of the triangular ligament, but not close to the median line. The transverse direction of the fibres of the triangular ligament gives it lateral strength and ventrodorsal flexibility. The fibres of the principal muscles cross those of the triangular ligament at right angles, and it is apparent that the central point may be displaced dorsally and drawn forward within normal limits without unduly straining the triangular ligament or rupturing its attachments. Its many component fibres yield or bend to an extent far beyond any that could be obtained by longitudinal traction. Briefly, the triangular ligament of the perineum in the female furnishes a fair amount of pelvic support, holds in place and attaches muscles, and furnishes a base for the attachment of the external genitals. Laterally it is strong; ventrodorsally rather less so, in keeping with the requirements of flexibility.

If we view the perineal region of a woman who has not borne children and compare it with that of one who has, a difference is at once noticed. A difference exists even though there has been no visible perineal tear in the second woman or when a tear has been treated by the usual primary operation. If the nullipara is young (Fig. 4) and a virgin it will be seen that the anus is well forward and that the perineal body is short in its ventrodorsal diameter. It may measure an inch and five-eighths, but is oftener an inch. The classical description makes it triangular on mesial section. Usually it is rather more circular, and the impression conveyed to the examining finger is that of a rounded mass. The sphincter ani externus furnishes a large part of its bulk, and the so-called central point is usually half an inch in front of the anus.

The perineal body is often described as though it were of itself a structure capable of rendering considerable support. In reality its importance is due entirely to the fact that it is the common place of union of the important muscles. If any part of the perineal body is entitled to the name central point, it is the ventral end of the sphincter ani externus, and this point is quite near the centre of the perineal diamond. Within reasonable limits, the closer the assembling of the muscles in the perineal body around this point, the better their function.

In a woman who has given birth to a child, the perineal region presents a different appearance (Fig. 5). The anus is always displaced dorsally. If the perineal body is superficially intact its ventrodorsal diameter will be greatly lengthened. If torn, the perineal body will be shortened, the mucous membrane everted, and the vulva will gape. If torn and repaired primarily, the perineal body will be lengthened ventrodorsally, shortened vertically and markedly triangular on mesial section. The dorsal displacement of the anus is a constant deformity.

The common conception of a perineal injury produced at childbirth is that of a sagittal splitting of the perineal body. It may be well to analyze such an injury, in or near the mesial plane, presuming it to have occurred without other lesions. The base of the triangular ligament would be split, the sphincter vaginæ would no longer retain the virtual dorsal attachment of its halves to each other, and the sphincter ani externus would be split at its ventral end if the laceration extended to the anal canal. The pubococcygei would lose their pre-anal attachment to each other. They would suffer, however, in no other respect and would continue to pull ventrodorsally, as would also the halves of the sphincter vaginæ prolonged dorsally by the halves of the sphincter ani externus. The integrity of the pelvic floor would probably be well maintained, excepting that its halves might separate slightly. This would be caused principally by the weight of the viscera above and partly by a slight obliquity in the direction of the pubococcygei. The insignificant transversi perinæi superficiales might aid in widening the mesial cleft, but the entire effect would not approach that produced by a real injury of average degree following childbirth.

It is apparent that sagittal splitting of the perineal body *per se*

will not produce the results so often observed in women who have borne children, and they must be explained in some other manner. If these results could follow a tear in any single plane, such a plane would be coronal rather than sagittal, and would involve more than the structures of the perineal body. Marked disturbance of function occurs many times, without visible severing of any muscle or perceptible tearing of the surface of the perineal body, and the disability is explained as follows:

In its passage through the perineal outlet (Fig. 6), the child's head encounters resistance in the relatively unyielding ventral half of the diamond-shaped space. Dorsally, resistance is much less marked. Consequently displacement of parts occurs in a downward and backward direction. The structures displaced are the lower part of the rectovaginal septum, the anal canal surrounded by the sphincter ani externus, the anococcygeal body, and the coccyx. The injury is a tearing and stretching of muscles and muscular attachments in their broad though correct sense. All the attachments in the perineal body are impaired or destroyed. The pubococcygei suffer all along their mesial borders. They appear to have retracted into the pelvis. This is true to a great degree, but is somewhat relative; the parts below, which have been torn from the muscular sling, occupying a lower plane. In addition to occupying a higher plane at the sides of the vagina, the pubococcygei are somewhat farther from the median line. If the perineal body is relatively whole, it is likely to be flattened horizontally and may be longer than normal. If it has been split sagittally it will be shortened. The base of the triangular ligament having been injured, a firm transverse attachment no longer exists. The sphincter vaginæ and sphincter ani externus are separated and fail to work together to maintain flexion of the coccyx, which is accordingly extended.

There is one important indication in the repair of an injured perineal outlet. All the muscles concerned in pelvic support and vaginal closure must be compactly attached between the vaginal and anal orifices. The structures of the outlet will then be reattached to the sling of the pubococcygei and the dorsally displaced anus advanced to the base of the triangular ligament and ends of the sphincter vaginæ. Incidentally, the perineal body will be rebuilt. Its location is important; its size and shape immaterial.

In the effort to restore the functions of pelvic support and vaginal

Fig. 5.

Relaxed pelvic outlet, without marked evidence of laceration of the skin of the perineal body. The dorsal displacement of the anus and gaping of the vulva are well shown. Drawn from a cadaver.

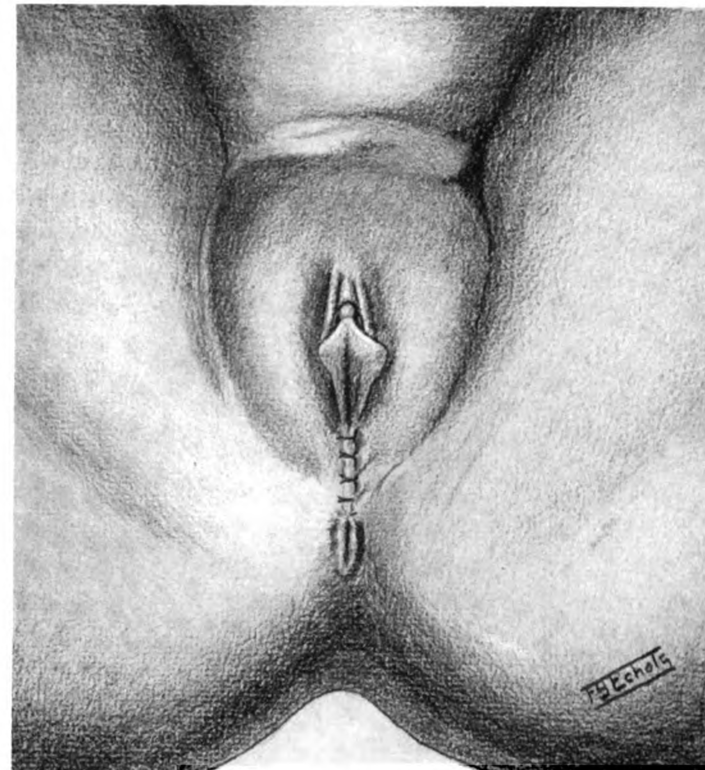
Fig. 6.

From a frozen section of a woman dying in labor. (Reproduced from Braune.) This drawing illustrates the manner in which the perineal body and anal canal become detached from the sling of the levatores ani. The rupture of the inferior muscular sling and the splitting of the perineal body occur at a later stage of labor.

FIG. 7.

Submucous perineorrhaphy performed on cadaver shown in Fig. 5. This result was secured by employing a U-shaped incision, which did not expose the ventral end of the sphincter ani externus. The sling-like effect of the pubococcygei is restored, but the inferior muscular sling is unrepaired and the anus remains dorsally displaced with a perineal body twice its original length.

FIG. 8.



Shows same cadaver as in Figs. 5 and 7. The U-shaped incision has been converted into a Y and the sphincter ani externus attached well forward to the sling of the pubococcygei. It has also been united to the triangular ligament at the points of dorsal attachment of the sphincter vaginæ. The perineal body is little longer than normal if at all.

closure, submucous or layer-type operations have been devised and perfected by numerous surgeons. These operations differ in details, but all depend for their success upon the firm support produced by drawing down the retracted pubococcygei and stitching them together in front of the anus. An additional step is to attach the sphincter ani externus to the restored muscular sling. The sides of the triangular ligament are brought together and the skin and superficial fascia closed over all. Operations of this type have been described by Babcock, Haynes, Hill, and Metcalf. I have employed at times modifications suggested by all these writers and can testify to their practical value. The results are such as to justify their enthusiastic advocacy.

The purely theoretical criticism to which this type of perineorrhaphy has been subjected is that the pubococcygei are drawn into an abnormal position. It is true that they are not normally found close together, side by side, between the anal canal and the vagina. Certainly they are not so placed to the extent produced by an operation of the type under consideration. They do have, in effect, however, just such an attachment, and, moreover, the functional result produced is such as to place at naught any theoretical criticism.

It cannot be denied that operations of the Emmet type are many times satisfactory. Their success also is dependent upon the mesial approximation of the pubococcygei. The much-criticised Tait operation gives fair results when these muscles are included, accidentally perhaps, in the somewhat massive perineal body produced by this ingenious procedure. Neither of the two last named operations is uniform in its results, because they are not exact. Whatever may have been the plan of their originators, the average surgeon makes of them a massing together of tissues. The steps of the submucous perineorrhaphy necessitate a more correct knowledge of anatomy. Its only real fault is one common to all perineal repairs, and that is, the tendency to construct a perineal body of such length as to prevent the advancement of the anus. Advancement of the anus means a carrying forward of the structures dorsal to the vagina and a coaptation of its dorsal wall to its ventral with the correct vaginal angle or curve.

Operations of the layer type are frequently performed in such a manner that the resulting perineal body is twice its original length (Fig. 7). It is evident that in such a repair the anus must be

displaced dorsally if the posterior margin of the vulvar cleft is properly located, as it usually is. It is possible to construct a long perineal body by extending it ventrally and still have the anus properly located as regards the bisischial line. Preferably a short perineal body should be built by a compact assembling of the muscles and fasciæ.

Originators of denudation operations placed great importance upon the particular geometric patterns outlined by the raw surfaces produced. Varying as they did, these operations could not have possessed equal merit, though possibly each was applicable to certain injuries. It is a reasonable contention also that the initial incision in a layer-type operation should be adapted to the condition that exists. Following an unrepaired tear, extending to the sphincter ani externus, a U- or V-shaped mucocutaneous incision with the ends terminating near the posterior caruncles may be made to reproduce a raw surface which corresponds closely to that existing after the injury.

If, however, the injury has been repaired primarily after the method of most obstetricians, or if the deformity is the result of stretching and flattening without marked laceration, a mesial incision may be preferable. In certain cases I have employed a Y incision, terminating the arms near the posterior caruncles and the base of the upright just in front of the anus. The mesial and Y incisions expose the ventral end of the sphincter ani externus, which will not be reached by the U incision when a primary repair has been secured by massing the tissues from side to side, or when the perineal body has been flattened and the anus displaced dorsally. When the U or Y incisions are made the mucous membrane of the side cuts should be brought together from side to side, thus lengthening the posterior vaginal wall. The pubococcygei of both sides are then freed by blunt dissection in the bisischial line. They are found at the sides of the vagina about an inch from the outlet. Each is pulled down through the incision that exposes it and the two are brought together in the median line as far forward as possible without unduly constricting the vaginal orifice. Thus the pre-anal attachment and downward convexity are restored. Two stitches usually suffice, the dorsal of which should be made to grasp the sphincter ani externus close to its superior border, which is, of course, its deep border, from the operative point of view. If the sphincter has been torn, an

extra stitch or stitches may be required to reunite its retracted ends. The bulk of the sphincter remains to be advanced and a central point established. Here certain anatomical and surgical refinements may well be disregarded in the interests of mechanical integrity. The triangular ligament should be united from side to side at a point as far forward as the union of the pubococcygei by a single stitch. The stitch may be made to include also in its grasp a small portion of these united muscles. A second stitch near, but dorsal to the first, should grasp the triangular ligament from side to side and also include firmly the ventral apex of the sphincter ani externus. Apparently the bulbocavernosus has been disregarded. Practically its dorsal ends will have been drawn together and attached to the ventral end of the sphincter ani externus. The attachment of the latter muscle to the ischia in the line of the transversi perinæi will also have been restored. The skin incision is then closed and the resulting repair is anatomically and functionally correct (Fig. 8).

There may be indications for additional operative steps or variations in matters of detail. Thus in the somewhat rare instances where one of the pubococcygei has suffered a distinct rupture transverse to the direction of its fibres, the torn ends should be reunited as advised by Metcalf. In an elderly woman with weakened muscles and a marked prolapse it may be advisable to construct a longer perineal body, producing marked diminution of the vaginal outlet. Even then the increased length had better be carried forward of the central point, avoiding always a pushing back of the anus.

In the type of operation described, there is no danger of injuring vessels or nerves of importance. In a general way these structures enter the diamond-shaped perineal space near its lateral angles and course forward somewhat parallel to the ventrolateral sides.

In an operation of the Tait or the Emmet type a large amount of tissue from each side is grasped by a mass suture which includes skin, fascia, and muscle. At least one such suture is placed between the ischial tuberosities with the intention of including the insignificant but overrated superficial transverse perineal muscles. It is not a remote possibility that such a stitch may sever a nerve trunk or branch either at the time the needle is passed or later by the pressure effect of the suture. Waiving this possibility, we know that a mass-sutured perineal body gives exquisite pain for several days, a distressing feature worth avoiding. And it is avoided in an operation

of the layer type. Vaginal mucous membrane is relatively insensitive, voluntary muscle tissue has a low degree of sensation, and the triangular ligament is also poorly supplied with sensory nerves. The most sensitive structure involved is the skin, and since there is not the slightest necessity to suture it tightly, no appreciable amount of pain results.

At one time all my secondary perineal repairs were of the Emmet type. They were productive of great pain. Performed in conjunction with an abdominal operation, the pain of the latter was by contrast so much less as to be practically disregarded. In recent years I have performed operations of the layer type on women who had previously undergone one of the Emmet variety. Their dread of pain has only been exceeded by their surprise and delight at its absence.

There are two striking tendencies among surgeons. One is to copy faithfully certain methods and technique; to perform named operations, disregarding individual variations. The other is to introduce variations in the attempt to devise something new, some operation that shall bear its originator's name. Neither tendency is altogether commendable. It is wise, perhaps, for students, internes, and occasional operators to familiarize themselves with one good operation of an approved type, but it is very evident that no single reparative operation can be the best for every injured perineum. On the other hand, departures from time-honored methods should be made only when better knowledge teaches better ways. If individual indications are met and anatomical principles applied details of technique may vary widely.

In conclusion I desire to express my conviction that secondary repair of the perineal outlet is indicated in practically every woman who has borne a child. The structures are always injured. True, at the present day they are usually repaired if an actual visible tear exists, but not one primary repair in a hundred comes anywhere near restoring the muscular attachments. More than all this, it is frequently desirable to strengthen the muscular attachments in the perineal body of a woman who has not borne children. Any injured, improperly repaired, or naturally weak perineal outlet should be subjected to an operation embodying the principles above described. Such a repair will follow the structural plan observed in nature. It will be anatomical.

Occupational Diseases

THE SANITARY CONDITION OF COAL-MINES

BY NAT. P. BROOKS, M.D.
CHARLESTON, N. H.

WHEN one turns to such a topic as the sanitary condition of coal-mines it would seem that there must be a great wealth of material for study, but one is surprised at the very meagre amount of medical literature on the subject of mine sanitation.

This can be rather easily explained, for to make a mine profitable it must be reasonably safe from explosion and fire, and to render it so means a good breathable air in all the workings; the pay is good for most mine work, while the miners will rarely work more than five full days in the week; the drainage of the mine is essential to its profitable working, and as good drainage systems are more economical, we get a better system than where a cheap makeshift can be used to the detriment of the men employed in the work—so we see at the start we must have conditions of air and drainage that are good, from the sanitary standpoint, or the work is doomed to failure economically. If we dip into life-saving and accident prevention, however, we find a much broader and more generally interesting field for study, one that is receiving much attention from both physicians and mine operators throughout the mining world. It is the purpose of this paper to deal largely with the general sanitary conditions as they are at present in the coal-fields of Coahuila, Mexico, with a few suggestions as to their betterment.

To the coal-mine engineer even more than to the sanitarian comes the problem of ventilation, for the coal-mine improperly ventilated results in a failure from a business standpoint. Few, if any, engineers give particular thought to the air requirements of their workmen, this being one instance where the air required by men and animals employed in the workings can be ignored as such, for we

find no mention of air requiréd per man in the English mine law, which is one of the most effective in operation. Briefly the English law reads, "each mine shall be so supplied with fresh air that all obnoxious, combustible, and explosive gases are rendered harmless," which means an adequate supply of air to all.

Following is a short summary of the air analysis from seven mines, representing two coal basins in Coahuila:

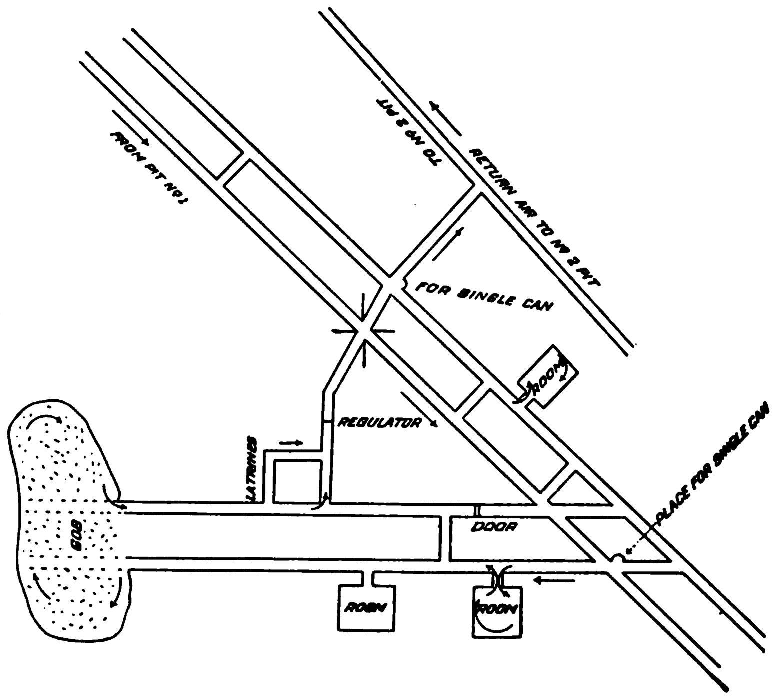
Palau Group.—Mule stable in the Palau group: CO_2, 1.2 per cent.; O, 18.2 per cent.; CO, trace; CH_4, 0.0 per cent. After readjustment the same reads: CO_2, 0.7 per cent.; O, 19 per cent.; CO, 0.0; CH_4, 0.0 per cent. Mine No. 4, north upper entry: CO_2, 0.9 per cent.; O, 20.4 per cent.; CO, 0.0 per cent.; CH_4, 0.1 per cent.; worst room sample No. 3; 5N.11, CO_2, 0.3 per cent.; O, 19.6 per cent.; CO, 0.0 per cent.; CH_4, 0.4 per cent.; main return at fan No. 3: CO_2, 0.5 per cent.; O, 19.9 per cent.; CO, 0.0 per cent.; CH_4, 0.2 per cent.; main return at fan No. 4: CO_2, 0.3 per cent.; O, 19.5 per cent.; CO, 0.0 per cent.; CH_4, 0.5 per cent.; main south return No. 2: CO_2, 0.6 per cent.; O, 18.4 per cent.; CO, 0.0 per cent.; CH_4, 0.2 per cent.; main north return No. 2: CO_2, 0.4 per cent.; O, 19.4 per cent.; CO, 0.0 per cent.; CH_4, 0.5 per cent.; total return No. 1: CO_2, 0.6 per cent.; O, 18.8 per cent.; CO, 0.0 per cent.; CH_4, 0.1 per cent.

The *Las Esperanzas* field does not give quite such satisfactory results, as the mines in that field are about five years older than the Palau mines, with the exception of No. 8, which, however, is connected with one of the oldest workings in the field. No. 8 is a 913-foot shaft, hot and wet; the others are slopes from the outcrop.

No. 8, first north ventilation: CO_2, 0.8 per cent.; O, 17.0 per cent.; CO, 0.0 per cent.; CH_4, 1.2 per cent.; 6th N. slope ventilation: CO_2, 0.2 per cent.; O, 19.8 per cent.; CO, 0.0 per cent.; CH_4, 0.3 per cent.; 6th S. slope ventilation: CO_2, 0.4 per cent.; O, 20.4 per cent.; CO, 0.0 per cent.; CH_4, 0.1 per cent.; first N. entry face roof: CO_2, 0.0 per cent.; O, 19.1 per cent.; CO, 0.0 per cent.; CH_4, 0.7 per cent.; first N. entry face floor: CO_2, 0.4 per cent.; O, 19.5 per cent.; CO, 0.0 per cent.; CH_4, 0.1 per cent.; rooms first west r. 9: CO_2, trace; O, 18.0 per cent.; CO, 0.0 per cent.; CH_4, 2.3 per cent.; disused room 1st N. r. 10: CO_2, 1.2 per cent.; O, 17.4 per cent.; CO, trace; CH_4, 0.0 per cent.; No. 4, slope face: CO_2,

0.4 per cent.; O, 19.4 per cent.; CO, 0.0 per cent.; CH_4, 0.6 per cent.; slope hot place, roof: CO_2, 0.5 per cent.; O, 19.0 per cent.; CO, 0.0 per cent.; CH_4, 1.2 per cent.; slope hot place, floor: CO_2, 0.7 per cent.; O, 19.3 per cent.; CO, 0.0 per cent.; CH_4, 0.2 per cent.; No. 6 slope face: CO_2, 0.7 per cent.; O, 19.7 per cent.; CO, 0.0 per cent.; CH_4, 0.4 per cent.; entry 8 south face: CO_2, 0.8 per cent.; O, 19.6 per cent.; CO, 0.0 per cent.; CH_4, 0.4 per cent.

FIG. 1.



Small area of inside workings, showing air currents, location of latrines, if these be used, or (as we deem best) single cans which are to be emptied into incinerators. "Gob" is a part of the mine that has been worked out but, not being filled by caving in of the roof, is still in connection with the mine. Arrows point with the air-currents.

The preceding figures are from the worst air samples taken in September and October of 1911. There were a few special test samples taken in which the CH_4 was much higher than in any shown in my tables, but those were not fair samples of the air as it reached the workers. In all the returns the air was taken after it had been used by the workers. The main returns at the fan contain the returns from the gobs and disused rooms, where the disintegration

of timbers and coal is more rapid; as there is no call for sending much air into such places. The return from the gob is direct to the fan, and that air never normally enters any of the used workings. The amounts of CO_2 are due to the ever-present disintegration in both coal and timbers, and are variously estimated as being from 10 to 100 times the amount thrown off from men, animals, and lights within the mines. This very wide variation comes from the character of the coal mined, moisture, temperature, pitch, etc. In the very poorest samples analyzed the per cent. of oxygen was nearly normal, 4 per cent. being the greatest drop, and that in a disused part of the mine. While there are places with a rather unsafe amount of CO_2, there were very few places reported where the air was stagnant, there being in all places a perceptible air-current while the fan was in operation. In comparing the report of the chemist with the air analyses of certain English and Scottish mines we find that our Mexican coal-mines compare very favorably in air analyses with those of England and Scotland, which are among the most modernly improved of any coal-mines.

The mine air temperature is high in all our mines, as the outside air ranges between 90° and 110° F. in the shade. Before open lights were abolished the temperature in some of the rooms in No. 6 and No. 4 Esperanzas reached 98° F., the high and low summer readings in the two mines being No. 6, 77° F. low, 98° F. high; No. 4, 76° F. low, 95° F. high; present summer readings No. 6, 77° F. low, 93° F. high; No. 4, 76° F. low, 90° F. high; No. 8, 70° F. low, 86° F. high, but the air in No. 8 is very humid. Drill-holes show a temperature of 60° F. at a depth between 60 and 70 feet, showing the usual increase of 1° for each 60 feet of depth below the line of mean temperature.

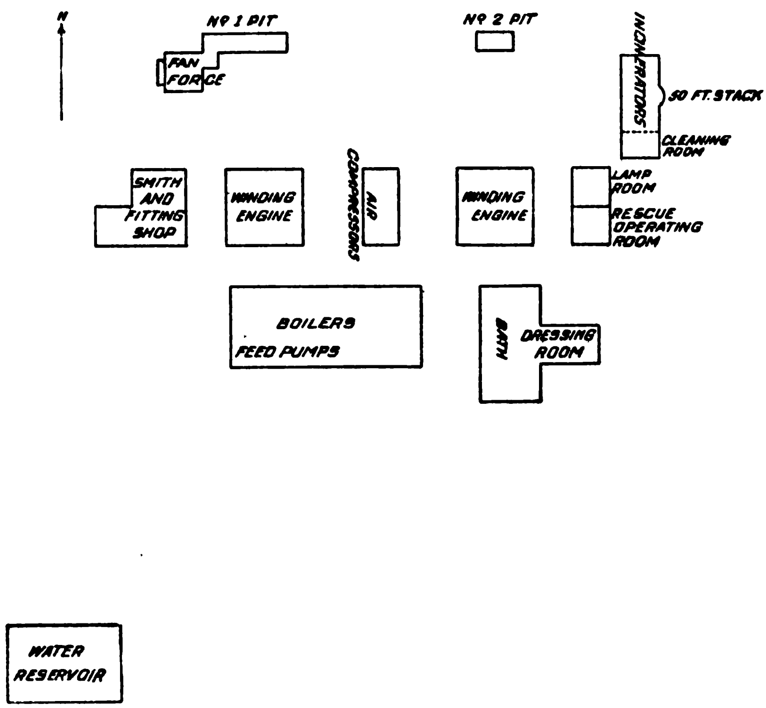
It will be seen from these figures that at least during the hot months we have the most favorable temperature for the development of the hook-worm larvæ. We have no exact temperature readings for the winter months, but they will probably show less than ten degrees lower than the average summer readings as given.

Sanitarians give 0.5 per cent. CO_2 as the point at which the effects of that gas are noticeable on men in factories or closed rooms, but my experience has been that it was not so in the mine, owing, I believe, to the fact that the CO_2 here is not due to animal life, but

to the changes in coal, etc., for which reason it is not heated and does not reach the breathing area of the worker in the percentage shown in the return air or samples of floor air.

The dust of a colliery is very explosive when dry, and when mixed with air it may be exploded by a blast, an electric flash, or an open light. This dust is not more irritating to the air-passages than is any other dust and the danger of explosion is a sufficient incentive

FIG. 2.



Outside plan of model arrangement of buildings in respect to pit mouths where prevailing winds are from southwest; tipple to be at No. 2 pit.

to most operators of dry mines to keep them sprinkled. I believe most of the mines in Coahuila, with more carefully constructed pit cars, could be kept safe from dust without sprinkling. The objection raised against sprinkling is the danger of spreading hook-worm disease. This is, however, a debatable point, as a study of some German investigators' work shows that differences in natural conditions of pitch and thickness of the seam, number of men, temperature, and

mode of working cause a wider variation in number of men infected than the sprinkling or non-sprinkling of the mine. If, as was done in an English mine, the infected pump water is used in the sprinklers, then, of course, the disease will spread at an alarming rate. Nearly all the Mexican mines at present permit the use of nothing except some form of safety-lamp, so the mine air is free from smoke.

I know of no coal company operating in Coahuila which pays the slightest regard to the personal hygiene of the men working underground. No matter how gaseous a mine may be, the miners are permitted to work, wearing no clothing, and the firing of a small pocket of gas, which would have been nearly harmless had the men been wearing light woollen shirts, may cause fatal burns. Except where there are considerable numbers of Japanese working, there are no company-furnished baths; the men coming from the pit must go to their homes to bathe and change clothing, and even the houses are not fitted with baths, many not even having water near. The Japanese baths are large tubs in which several men bathe at the same time, and cannot be called hygienic. The native workmen as well as the Japanese practically all wear sandals in the mine, as shoes are expensive and of a very poor quality. The Mexican workmen will take little care of their feet, in consequence of which they suffer a great deal from what they call "broncy," which is an aggravated chapping. This is seen mostly in winter, when many of the men will be incapacitated for work in the mine. Ground-itch is also getting only too common in a few localities during the summer months. Both diseases are rarely found among the Japanese laborers, on account of their habit of taking a hot bath as soon as they leave the pit.

There are no rules or regulations as to promiscuous expectoration, urination, or defecation, and as a result there are many very filthy spots in every mine. It would seem, however, that expectoration is of comparatively little importance, there being usually enough moisture to prevent the drying of the expectorated matter.

Before taking up the problem of hook-worm disease I will give my mortality statistics, covering a period of three years, for camps where between 400 and 600 men were on the monthly pay-roll. There were during this time no explosions or other great mine disasters. The following figures are for the men only, and with two exceptions

the men were on the company pay-roll at the time of death. Natural causes: nephritis, 2; tuberculosis (pulmonary), 2; pneumonia, 1; gastro-intestinal affection, 1; cardiac disease, 1; bronchial pneumonia in man of seventy, 1; inanition due to old age, 1 (ninety years); total, 9. Accidental deaths: Inside mine—rock-falls, 4; gas burns, 2; runaway trips, 12; electric current, 2; outside mine—shot in drunken squabble, 1; steam burns, 2; car accidents, 3; acute alcoholic poisoning, 2; total of accidental deaths, 28. Ten of these occurred in camps where I merely filled in for a few days during the absence of the regular surgeon. The ratio in the camps where I was in full charge was, for the three years, two deaths from injury to every death from disease.

Dr. Higgins, of Agujita, who has been in close touch for several years with the coal-mines in the Sabinas River Valley, writes that he has seen but one case of hook-worm infection, and that in an American from near El Paso, Texas. His experience coincides with mine, that there is little pulmonary disease. He has no figures of the mortality among the men, but from conversation with him I estimate that the ratio, barring one or two bad accidents, would be about as I have given it. Counting the deaths in the big explosions, the ratio would probably reach 1 to 5 or 6 for some camps, and would bring the ratio for the coal-fields entire to 1 to 3 or 4. Drs. Hara and Payne would give a larger ratio, as they were at gaseous mines before safety-lamps were installed.

The preceding figures show that as yet hook-worm disease is claiming few victims, though what will be the result in another five or ten years if there are not some vigorous steps taken to prevent its increase is not so very hard to conjecture. At present the severe cases are rare. In all the camps my records for the past fifteen months show eleven cases, ten Mexican, one Japanese, treated for that disease; nine of these came from No. 8, the other two were from No. 4, but one of these had worked in No. 8. The other one had never worked in any mine but No. 4. He showed the disease positively, as did two from No. 8. The others failed to bring me any of their fæces for examination, the diagnosis being made from clinical symptoms and blood-smears. One of the positive cases from No. 8 was the worst seen; he showed hæmoglobin 75 per cent. (Talquist's method). No. 8 mine was not directly under my charge, so I had little chance

to study the cases from there; those suffering the worst came to me because I had helped their friends. It is very probable that an examination of the fæces would show the presence of the disease in 50 per cent. of the men now employed in that mine; fully 10 per cent. show the effects of the disease in the face.

When I first went to the coal-fields little had been written on the subject of hook-worm disease. I saw several cases of what the men called mine sickness, but these I had not attributed to hook-worm until after reading Bass and Dock on the subject, though at that time I did treat one rather bad case that from clinical symptoms was diagnosed as hook-worm. The menthol given made the man very sick for a few days, so he did not come to me for several months, and he then showed no anæmia in the mucous membranes and was apparently in very good health. The milder cases of mine sickness improved markedly in a comparatively short time under ordinary tonic treatment, if they changed to outside work, and were probably mild cases of hook-worm disease. That was in one of the oldest coal camps in Mexico, which has since been worked out and abandoned.

The disease was probably introduced by some of the American miners who went to the earlier fields in considerable numbers, due to labor troubles, and seems most prevalent in the sections visited by them. The native labor has come largely from the dry mesa country of the State, few coming from the known infected parts of Mexico. I base my belief largely on the statement of a contractor who has been in the coal-fields since they were opened, and who says that many of the miners coming from the States were sick with mine disease and that nearly all improved in health while working in the new Mexican mines. From wherever it came, it is most firmly established in mine No. 8, with a few cases in all the camps.

The fact that this disease has not become more prevalent is due to several factors: the average life of a Mexican coal-mine is rather less than ten years, the majority of the mines are dry, and outside conditions are very much against its spread, so the children are not exposed to the infection. There are a few notable exceptions where the disease has gained a hold and we find everything favoring its spread, a striking example of which is the No. 8 of Las Esperanzas mines, a deep, hot, wet mine, where no precautions have been or are

apt to be taken to safeguard the men. The miners go to their work in bathing suits or in even less attire, wearing sandals or bare of foot. There are no privies provided under ground, none of the feeders are limed or in any way treated, nor is there any rule as to where the men may defecate. The country is without suitable mine regulation laws, the general sanitary regulations are poor, nothing is being done by the government, nor have the companies made any move to investigate or combat the invasion of hook-worm disease.

The general health of the miners and their families is good, considering the diet and the dirty, careless methods of preparing the food, as well as their habits of life in general. The most common ailments are due to intestinal parasites, of which the most common in the children is the round-worm (*Ascaris lumbricoides*); in the adults, tapeworm, trichiniasis, and pin-worms are quite common. Pork is a favorite meat, though not eaten raw extensively. The pigs run loose about the camps and are the general scavengers. They also keep the latrines cleaned, as practically all of these are open so that the hogs have free access to them, and the pig brigade makes its daily round of all such places, visiting as well the spots in the chaparral generally used for such purposes. The camps are usually supplied with good water, either from the streams tapped by the mine or from a neighboring stream, so the source can be safeguarded to a certain degree. Typhoid fever is not very prevalent, more of this disease being seen in some of the little towns which are dependent on wells for their water-supply. As a rule, the disease is mild. Smallpox is practically endemic in all the mining regions, though the foreign companies, with the aid of the government, have done much to prevent any serious epidemics. In my three years not a case of smallpox or scarlet fever developed in my camps; there were a few cases of typhoid, the majority of which could be traced to outside infection, three cases of diphtheria, measles, whooping-cough, and mumps were more or less prevalent each winter. A large number of the miners are nomadic in habit, the men working from one camp to another, a condition which renders it very difficult to deal successfully with contagious disease, there being no satisfactory quarantine laws in force. Serious pulmonary diseases are rare; tuberculosis is not prevalent in the newer and smaller camps, though the older camps and towns have considerable of that

disease, especially where the houses are of adobe with dirt floors. Any one knowing the Mexican habit of spitting anywhere and everywhere would expect more tuberculosis than my experience disclosed. Despite the general belief, syphilis seemed to be no more prevalent in the mining camps than one finds in the United States among similar classes of people. Other venereal disease is, however, very prevalent, despite which ophthalmia neonatorum is rare, though most of the obstetrical work is done by untrained mid-wives. With goats' milk selling at 20 cents a quart and cows' milk at times unprocurable, the infant mortality is surprisingly low. A few general sanitary laws well enforced would place the coal camps of Coahuila among the most healthy mining camps in North America, and I believe they are to-day as healthy as the average of mining towns anywhere.

Eugenics

THE SCIENCE AND PRACTICE OF EUGENICS OR RACE-CULTURE*

BY MEYER SOLOMON, M.D.
Junior Assistant Physician, Government Hospital for the Insane, Washington, D. C.

I. INTRODUCTION AND DEFINITION

In 1862, as his preface to the first edition of his remarkable "Les Miserables," Victor Hugo wrote but a single sentence. But it is a sentence which causes one to ponder seriously:

"So long as there shall exist, by reason of law and custom, a social condemnation, which, in the face of civilization, artificially creates hells on earth and complicates a destiny that is divine with human fatality; so long as the three problems of the age—the degradation of man by poverty, the ruin of woman by starvation, and the dwarfing of children by physical and spiritual night—are not solved; so long as, in certain regions, social asphyxia shall be possible; in other words, and from a yet more extended point of view, so long as ignorance and misery remain on earth, books like this cannot be useless."

Society has had to contend with these problems at all times and in all places. They are as patent, as urgent, and as important to-day as ever in the past. They are of the utmost importance to the individual, to the community, to the nation, and to humanity in general. Similar conditions exist at the present time. Is there any means of controlling, correcting, or bettering this state of affairs, even if only in the slightest degree? If there be any such possible means, it should be the subject of most vital and constant discussion. It seems at times that in our rapid advance in modern civilization we have lost sight of the disease, crime, and degeneracy about us. Yes, we have become so accustomed to them that we have come to look upon them as necessary evils. We have entirely neglected the question of the possibility of race-culture or eugenics.

Medicine and sociology are closely wrapped up in each other—they dovetail into one another. At the root of all social conditions we need medical aid—in sanitation, public hygiene, personal internal and external hygiene, physical and mental. What were previously looked upon as purely medical problems are now considered from their sociological standpoints; and problems hitherto viewed as exclusively sociological are now recognized as being very intimately interwoven with the problem of the care of the public health.

* Submitted as a Thesis for Promotion to Assistant Physician, Government Hospital for the Insane, Washington, D. C.

Forel,[1] in his preface to "The Hygiene of the Nerves and Mind in Health and Disease," has given us a very good definition of popular hygiene. He says: "My conception of popular hygiene is that it enables an intelligent layman with a fair education to govern his life in such a way as to avoid diseases and abnormalities as far as possible for himself, his fellowmen, and his offspring, and to promote the health and strength of them all in every respect." This is the broad principle of prevention of disease. Hygienic and sanitary principles are gradually being forced upon the laymen, and when, subsequently, they learn the underlying scientific principles, they follow them the more understandingly, willingly, and conscientiously. But before this was possible the principles of prophylaxis and simplified methods of living had to be inculcated into the medical profession. There is stirring now a tendency toward a widening of the field of prophylaxis from personal physical hygiene to personal mental hygiene; there is a trend toward public or social hygiene, the person here considering not only his own welfare but also that of the community as a whole; and lastly, but from the breadth of its scope and aims really most important of all, comes racial hygiene, or the betterment of the human race by the greatest possible elimination of the bad, and the fostering and treasuring of the good for the supreme function of parenthood, in order that the torch of life may be transmitted undimmed to the next generation. Since we believe with Ruskin that "there is no wealth but life," and since, in addition, perfect health in all respects is essential for the best functioning of an individual in any walk of life, no stone should be left unturned to arrive at the means of producing the best type of men and women, of purifying, bettering, advancing the race, It is just this which is the object of eugenics or race-culture.

Our best definition of eugenics is that of its founder, Sir Francis Galton[2]: "Eugenics is the study of agencies under social control that may improve and impair the racial qualities of future generations either physically or mentally."

Let us here turn our minds to this momentous question. It is so broad, and its ramifications are so numerous, that only some of the most important points can be touched upon in this paper.

II. THE SCIENCE OF EUGENICS

The growing necessity for some kind of guidance in our method of attacking many of the fundamental problems of human life and social improvement and progress has been felt for some time by biologists, social workers, thoughtful students, and observers of human life everywhere. The facts and foundations of eugenics are not complete in any particular. Although social in practice, it is biological in fundamentals and theory. In fact, the science of eugenics is really built on the overlapping fields of biology and sociology. We must therefore take the biological approach to its treatment. After reviewing eugenics as a science, we will then be in a position to discuss eugenics as a practice.

a. THE FUNDAMENTALS OF BIOLOGY

In entering upon the field of biology we encounter many extremely diverse and conflicting opinions. Many of the essential theoretical fundamentals are still hotly-contested questions. We shall, however, not enter into any discussions of these subjects.

1. *The Origin of Species*

The origin of species and the descent of man by organic evolution is now universally accepted. We hear much these days about the decline of Darwinism. But by this is not meant that the theory of descent or evolution is being discarded by scientific men. The general theory of descent was clearly mapped out long before Darwin's time, but in his "Origin of Species by Means of Natural Selection; or the Preservation of Favored Races in the Struggle for Life," Darwin argued for the truth of evolution so well that it came to be generally accepted. In his book Darwin tried to give an explanation of the causes which brought about evolution; and by Darwinism is meant the theory of natural selection.

Briefly, the theory of natural selection may be stated as follows: Organisms tend to increase rapidly. The number of individuals produced is always greater than the number that will survive. Some seem to live only to die. Others just keep alive. Still others are certain to live and propagate their kind. This is determined by the struggle for existence. There is an untiring struggle with the environment and between individuals of the same species as well as of different species. Those best fitted to their particular environment survive because they are selected by nature without any external interference of any sort—by natural selection. The least fit perish. It is to be noted that "fit" as used here must be taken in its literal sense. Just as a finger fits into a glove, so an individual may be considered to fit into his environment. An individual unfit for one environment may be fit for another. Those who are most successful in the struggle for existence not only survive but also propagate their kind. Just as the parents were fit, so the offspring are even more fit. We therefore have inheritance of those qualities or characteristics which made one individual more fit than the other to meet the demands of the particular life they had to lead. The utility of any one character to an individual adds just so much to his fitness, the useful quality is further developed, and, since nature is acting continually through all ages by just such elimination and survival, there is consequently a progressive evolution of characters of all sorts.[3]

This survival-value, or value for life, is dependent primarily on the preexistence of variations. This variation refers not only to the species, but more particularly to the individual. It has been truly said that "if one were to make the effort, he would find that it is possible to distinguish differences between every two spears of grass in a meadow or every two heads of wheat in a grain-field." Nature knows only the individual—the unit. Species are but convenient and arbitrary classifications of the forms of life. There is no sharp line of demarcation anywhere in nature. Each type blends insensibly, merges gradually into the other. There is always an overlapping borderland area. But it is just these differences or variations which are the means of adapting individuals to every little difference or advantage in their environment. It makes them more or less fit for survival in the struggle for existence.

Excluding the death of many organisms from purely accidental causes—which destroy the fit as well as the unfit—Darwin believed that natural selection held sway. His theory of sexual selection as an explanation of the secondary sexual characteristics is but a special application of natural selection.

Darwin believed that by natural selection new species could be formed. He argued for the existence of innumerable slight, fortuitous, fluctuating variations which were inheritable, and for the occurrence of new species in perfectly

gradatory and continuous series as the result of the greater and greater accumulation in successive generations of these slight, useful variations. But this theory depends absolutely on the pre-existence of variations.

It is believed by many that natural selection is the great conserving factor of evolution. It cannot create new forms or species. It has nothing to do with the direct origin of species, but with the survival of those already formed. It does not give a causo-mechanical explanation of evolution. There are thus factors of evolution other than natural selection.

Darwin himself believed that natural selection was the main, but not the exclusive, means of modification or of species-formation. He admitted the existence of the inheritance of acquired traits as a helpful addition in evolution. The later followers of Darwin, led by Wallace and Weissmann and called Neo-Darwinians, believe in natural selection as the sole and all-sufficient explanation of species-forming. Lamarck's theory of the inheritance of acquired traits as an explanation of the method of adaptation and species-forming has no real proof in its support, most of the work done is destructive, and it is now generally discarded. Functional or acquired modifications are not hereditary.

The Darwinian theory is based on the existence of indeterminate, fortuitous variations. As a result of natural selection only favorable adaptations should persist. But it is known that indifferent traits or even harmful traits or disadvantageous development also persist. The theory of orthogenesis is based on the belief that variation is the actual determinant factor in species-forming or descent—that is, the existence of predetermined variations or development along definite lines. It has been suggested that orthogenesis and natural selection work together as factors of evolution, determinate orthogenetic variations being preserved by natural selection.

According to Darwin, species are formed slowly by the gradual selection of the advantageous variations among the regular, slight, fluctuating fortuitous variations. The theory of heterogenesis or mutations, as elaborated by DeVries, is based upon the occasional formation or occurrence of a new species suddenly and in fixed form by the appearance of definite, inheritable characteristics differentiating it from the old species. In other words, there is evolution by leaps and bounds.

It has been proven that by isolation and in-and-in breeding new congenital variations may appear, become established, greatly developed, inherited, and distinct new species result. This may be produced by geographical or topographical isolation or by biologic isolation (due to separation into groups by structural and physiological characteristics) which prevents interbreeding. These are the so-called isolation theories as causal factors of descent of species. Isolation is, however, merely a tremendously favoring condition, but not a primary cause of species-forming.

In conclusion we may say that Lamarck's factor offers us no theory of heredity, Darwinism and Neo-Darwinism are inadequate explanations, while natural selection, orthogenesis, and mutation are probably combined factors.[4]

This leads us to a brief consideration of the question of heredity.

2. *Heredity*

Heredity is the genetic relation between successive generations, or the biological activity by reason of which one generation transmits its characters to the next. Heredity is one of the greatest and most important scientific problems. It is important in pure and applied science. It is one of the central

themes of biology, being bound up with the problems of development, reproduction, fertilization, variation, etc. It is the bed-rock of the science of eugenics.

The theories of preformation, epigenesis, Spencer's physiological units, and Darwin's gemmules are no longer supported by biologists.

One of the basic principles of heredity is Weissmann's theory of the continuity of the germ-plasma. According to this theory, there exists, in the reproductive organs of each individual, male and female, a germ-plasma. This germ-plasma is resident within the germ-cells. These germ-cells have no relation with the soma- or body-cells, the latter comprising practically all the other cells in the body. Activities or modifications of the body-cells have no effect upon the germ-cells, which can be affected only by such general conditions as toxæmias, bacteræmias, intoxications, and disturbed metabolic states capable of affecting the general bodily fluids and thus the tissue fluids from which the germ-plasma receives its nutrition. It is the germ-plasma which goes to form the new individual, in whom it again takes up its abode within the reproductive organ. Thus it passes through successive generations, ever unchanged except by such general conditions as were just mentioned.

There is no distinct proof that the chromosomes constitute the germ-plasma, as believed by Weissmann. Nor is there any real foundation for Weissmann's "idants," "ids," "determinants," and "biophores." Moreover, the question of the identity of the specific inheritance material is based upon the subdivision of the germ-cells into purely hypothetical units of no real importance; for whatever differentiated units do exist in germ-cells are all combined into a system. There is organization. The entire cell, nucleus and cytoplasm, is a physiological unit in metabolism, differentiation, and heredity.

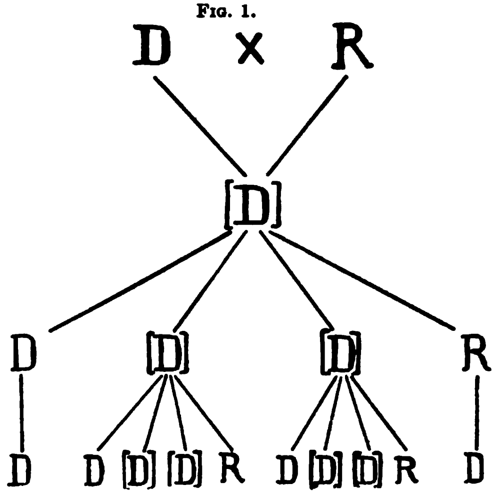
As a result of the experimental study of variation and heredity, Mendel[8] found that on crossing the tall and dwarf varieties of plants the next generation consists of only tall plants. Let us, therefore, call tall "dominant" (designated by D) and dwarf "recessive" (designated by R). When these cross-bred plants fertilize themselves in the next generation there result tall and dwarf plants in the proportion of approximately three tall to one dwarf. The recessive dwarfs, when self-fertilized, produce only dwarfs for any number of generations—they are pure recessives. The dominants (tall), when self-fertilized, produce one-third pure dominants (which on self-fertilization produce only dominants for any number of generations) and two-thirds cross-bred dominants which are impure or hybrids. In other words, there are one-fourth pure dominant, two-fourths impure dominant or hybrid, and one-fourth pure recessive. The hybrids, when self-fertilized, again produce pure dominant, impure dominant or hybrid, and pure recessive in the ratio of one, two, and one. This is represented diagrammatically in Fig. 1.

This has been found to be true for many characteristics in plants and animals. For example, if a gray house mouse be crossed with a white house mouse the offspring are all gray. Gray is dominant; white or albinism is recessive. When the gray hybrids are inbred, the offspring are gray and white in the ratio of three to one. The whites, when inbred, are found to be pure—produce only whites for all subsequent generations. Of the grays, when inbred, one-third produce only gray, which are found to be pure on inbreeding, and two-thirds, apparently indistinguishable from the other grays, produce gray and white in the ratio of three to one, the new generation again acting in a manner similar to the preceding one.

Thus, in general, this law may be laid down: Of a pair of differentiating characters, one of which is dominant (D) and the other recessive (R), some may be pure recessive (RR), others pure dominant (DD), and others impure or hybrid dominants (DR), which when self-fertilized or inbred give pure dominant, impure dominant or hybrid, and pure recessive in the proportion of one, two, and one.

As an explanation of these results we have the theory of gametic segregation. In the reproductive organs there is a segregation of the germ-cells, male and female, into two groups, equal in numbers. One group contains the constituents corresponding to the dominant characteristic for which it consequently has the potential quality; the other group contains the constituents corresponding to the recessive characteristic for which it likewise has the potential quality. If both the male and female germ-cells which unite possess potential qualities for the dominant characteristic all the offspring are pure dominant; while if

Fig. 1.



Mendelian inheritance in peas. *D.* tall plant of pure strain; *R.* dwarf plant of pure strain; [*D.*] tall plant in which the dwarf character is latent; [*D.*] plants when self-fertilised produced plants in the following proportions: 1 *D.*, 2 [*D.*], 1 *R.* (After Punnett.[5])

both cells have the potential qualities for the recessive characteristic all the offspring are pure recessive. If the male and female germ-cells are of opposite kinds, the offspring are hybrid, each of these in turn possessing in equal numbers two kinds of germ-cells (two kinds of egg-cells and two kinds of sperm-cells). These hybrids, when inbred, have not the choice of uniting with the freedom enjoyed by their parents—that is, dominant with dominant, recessive with recessive, or dominant with recessive—but the result must always be offspring pure dominant, impure dominant, and pure recessive in the proportion of one, two, and one. Fig. 2 clearly explains this diagrammatically.

Purity of type is thus dependent on gametic segregation.

It may be here mentioned that this dominance or recessiveness is not complete in all cases. It may be only partial, as in the case of the Andalusian fowl, of which there are pure blacks, pure whites, and impure or hybrid blues, the latter of which, on inbreeding, produce one-fourth pure blacks, one-fourth pure whites, and two-fourths hybrid blues.

Dominance is an important and the usual, but not the essential, feature of Mendelian heredity.

Other relations than 1 : 2 : 1 are found to exist, because of the increasing complexity of the phenomena of heredity. Also less usual Mendelian phenomena like "sex limitation" and "gametic coupling" occur. These are, however, all explainable along these lines.[9]

At present Mendelian application is limited. It is not known whether it is universal. Already it has been proven true in numerous varieties of plants and animals, and, as will be explained later on, attempts are being made to apply it to man.

FIG. 2.

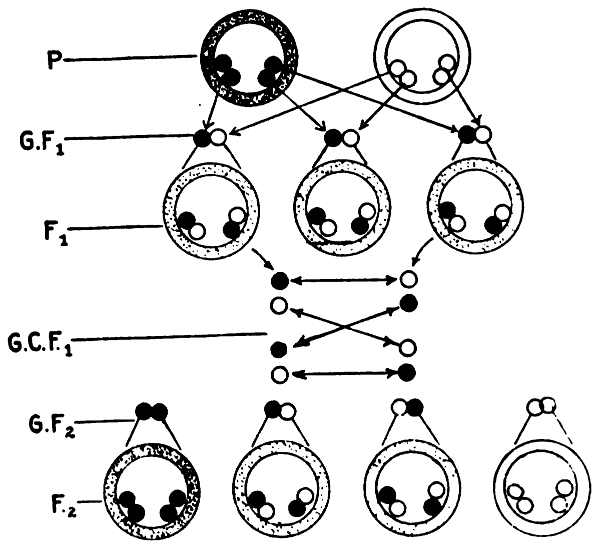


Diagram illustrating the relation of the germ-cells in a simple case of Mendelian heredity. The spaces between the large circles represent the bodies of the individuals, while the small circles within each represent the germ-cells formed by those individuals. *P*, parental generation; each individual forms a single kind of germ-cells. *G. F.* 1, germs of the first filial or hybrid generation, each composed of two different kinds of germ-cells, one from each parent. *F.*1, individuals of the first filial or hybrid generation developed from *G. F.*1. Each member of this generation forms two kinds of germ-cells on approximately equal members. *G. C. F.*1, germ-cells of *F.*1 showing possible combinations resulting from the mating of two members of *F.*1. Each of these combinations occurs with equal probability. *G. F.*2, germs of second filial generation resulting from the above random combination. *F.*2, individuals of second filial generation. Each now forms germ-cells like those which constitute its own germs. (After Kellicott.[10])

b. BIOLOGICAL PRINCIPLES APPLIED TO MAN

"The proper study of mankind is man," and the greatest function of science is to be of value to mankind. Practical science is of immediate value to mankind. Pure science looks forward to the future as the time when it will be of practical value to mankind.

Are any or all of these laws applicable to man and to what extent?

1. *Man's Place in Nature—Natural Selection and Variation in Man*

First as to natural selection. Darwin himself did not apply natural selection to man. Wallace, the other great discoverer of natural selection, but of the Neo-Darwinian school, believes that it holds true for man. There are those who state that natural selection is true for all forms of life except

man. In man we have consciousness developed to its highest degree. Man does not merely react to his environment. His is not a passive existence. But, owing to the evolution of his consciousness,[7] he moulds and shapes his environment to suit his inner needs, longings, desires, aspirations. He does not merely adapt himself to his environment. It is not his intention to simply fit into existing conditions. But he creates and recreates. He shapes nature's course by his consciousness, his intelligence. He betters his environment. He has changed the very face of the earth. There is a mutual interaction—the environment acts upon the individual, and he in turn adapts and tries to remodel it to suit his inner yearnings. It is man's constant struggle, his everlasting thought. Who has not said with old Omar?—

> "Ah Love! could you and I with Him conspire
> To grasp this sorry scheme of things entire,
> Would not we shatter it to bits—and then
> Remould it nearer to the Heart's Desire?"

Is man, therefore, not subject to the law of natural selection? It seems to me that he is—limiting natural selection to its police-controlling power over species already existing, not having any function in the forming of new species, but choosing which shall survive and which shall die. Those who survive have certain characteristics useful and advantageous in the struggle for existence in the special environment in which they live. In this struggle of man against man, tribe against tribe, nation against nation—that is, of society against society—and of humanity in general with environment, certain qualities have a certain survival-value. Some are of greater, others of lesser, value for survival for life in the struggle for self-preservation and propagation. We have many physical and mental traits. Each physical and each mental trait has a certain survival-value. But, in general, which has the greater survival-value—the physical or the mental? Both are essential. In times past brawn was a great factor. As civilization has advanced, the struggle has been transferred from the physical to the mental sphere. It is brain and not brawn that rules in modern civilization. We may say with Saleeby that "the evolution and dominance of mankind is due to the emergence and increasing dominance of mind."[8] We must agree with Forel that the brain is the man. Bodily or physical qualities are of real value only insofar as they serve the mind or psyche.

Variations are as marked in man as elsewhere in nature. No two living persons are exactly alike in every respect. And according as these variations or differences are physical or mental (intellectual and moral) there is a correspondingly relative survival-value. In man, as in other forms of life, we find a great number of deaths occurring from accidental causes which attack and destroy the fit and the unfit. Excluding these accidental deaths, if nature were permitted to run her own course, those who survive and propagate their kind would produce offspring that are more and more fit in each successive generation, thus making for uninterrupted, progressive evolution. But here man has interfered. In the lower forms of life advance is made by "murdering and being murdered" cruelly by nature. Most individuals die as a result. Huxley has stated that the cosmic process is opposed to the ethical, so that that which is ethically best involves a course of conduct which is opposed to that which leads to success in the cosmic struggle for existence. However, we must remember that this "murdering and being murdered," the soul unfolding itself "through blood and tears," seemed necessary among the lower forms of life. But man, by the development

of his moral qualities, by that highest form of development disclosed by sympathy, has greatly transformed this condition. By an ever-increasing knowledge of nature's laws, by the application of scientific principles, he has in great measure overcome this cruel method of nature. He cares for and protects the weak, the injured, the diseased. He does not permit nature to ruthlessly carry on her slaughter. But in spite of this the struggle goes on as fiercely as ever before, mind against mind. The individual who has inherited the physical and mental traits most useful in his environment will be most apt to succeed.

2. *Nature's Process Is Constructively Conservative*[8]

Natural selection tends to bring about the extinction of the weaker, unfit type, thus causing progress with evolution. But there are other favoring factors which go to maintain and make certain racial advance.

Weissmann's theory of the continuity of the germ-plasma with the division into germ-cells and soma- or body-cells, together with the failure of the inheritance of acquired characters, are both constructively conservative. This is further encouraged by Galton's law of filial regression, which states that in each successive generation there is a tendency to return to the mean, an ancestral "pull" or tendency to bring the individual towards the average. For example, the children of tall parents are as a rule not so tall (that is, they are shorter), while the children of short parents are not so short (are taller). This law has been found to apply to physical and psychic traits. Diagram 3 illustrates this in the case of heights of fathers and sons.

This explains why the race advances so slowly. But, though it be slow, it is permanent. It would be highly advantageous to the race were all the useful qualities and the virtues which were acquired transmitted directly and in equal degree to the offspring. Yet, if this applied equally to the bad qualities and vices acquired, it would be most harmful to future generations. Therefore bodily functional modifications, acquirements of all sorts, good and bad, are discarded. The tendency or predisposition to certain diseases or abnormal conditions may be transmitted, but their development and form of appearance depend greatly on environmental conditions. This has a wide application to physical and mental diseases of every nature.

Each generation is given a fresh start. Moreover, although the germ-cells may be affected by general disturbed metabolic states, bacteræmias, toxæmias, and intoxications, they are much more resistant than the soma-cells. The latter may be affected early. But only prolonged, severe conditions of this sort will attack the germ-cells. See how careful of the type nature seems!

And then again, there is Galton's law of ancestral inheritance, according to which there is an average degree of resemblance between parent and child, and this degree of resemblance is lessened in geometrical progression (by the continual division of two) as we pass to grandparents and great-grandparents. In other words, of all the heritage which is possessed by any individual, one-half is derived from his parents, one-fourth from his grandparents, one-eighth from his great-grandparents, one-sixteenth from his great-great-grandparents, etc. (only one-sixteenth from all the rest combined). Diagram 4 shows this very nicely. Thus, direct heredity is most important, and of this, three-fourths comes from the parents plus the grandparents.

This should not make us blind to the importance of inheritance other than direct parental transmission. For, following Mendel's law, a recessive condition

may remain hidden for one generation, only to crop out in the next. This gives us an explanation for so-called "reversion" and "atavism." Then, too, even though an abnormal character has existed in a family, if certain members have bred true for three generations, the disease will not reappear in that family. Likewise a pure bred may be derived from a hybrid in a single generation; and, even though the pure bred thus produced comes from a long series of hybrid individuals, it is just as pure as the pure bred which has never had a hybrid in any of his ancestry. And if Mendel's law is applicable to human culture, it is of decided importance in determining which are fit and which are unfit matings,

Fig. 3.

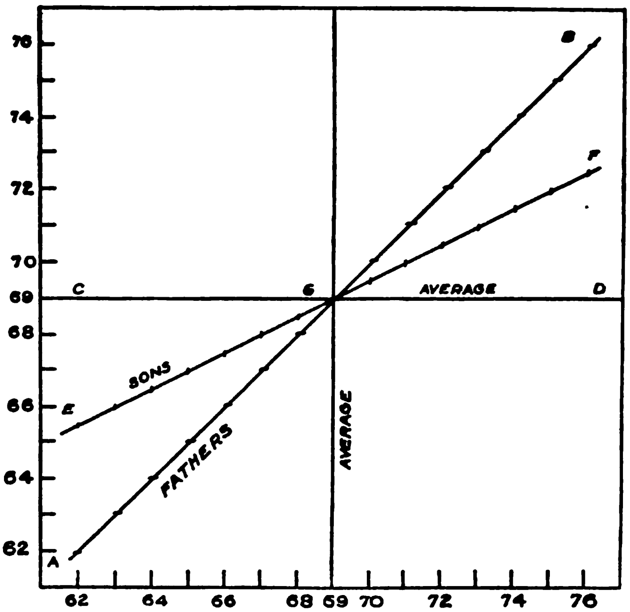


Diagram illustrating the phenomena of regression. Here are plotted first the heights by inches of a group of fathers, giving the series of dots joined by the diagonal AB. Next are plotted the average heights of the sons of each class of fathers: 62-inch fathers give 66-inch sons, 63-inch fathers 66.5-inch sons, 64-inch fathers 67-inch sons, and so for all the classes of fathers. These dots are then joined by the line EF. This is *the regression line.*

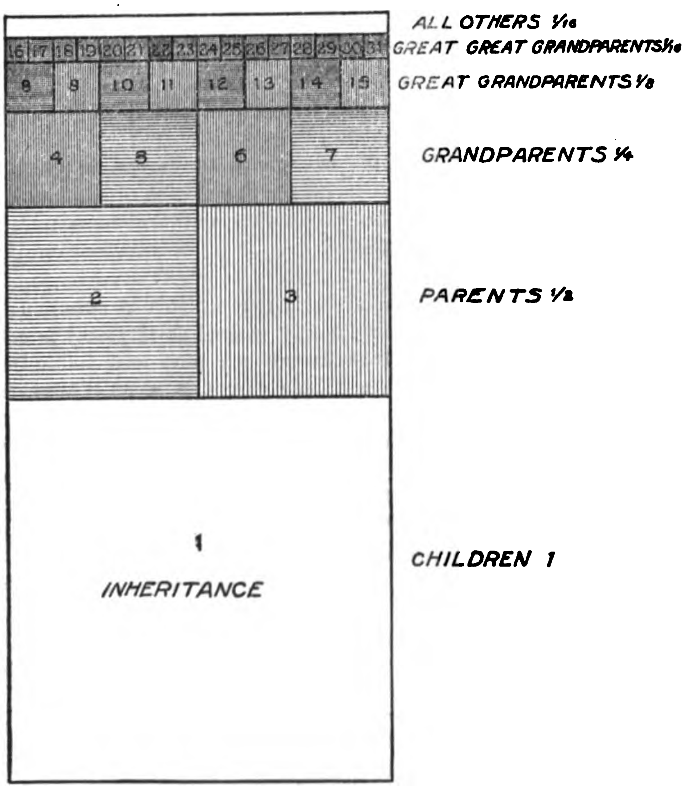
while the possibility of its application in the mixture of races having distinctly different characteristics obviously has a great bearing on our immigration problem.[11]

3. *Species-forming in Man*

If Mendel's law is of universal application we can see at once how new species can be formed only by mutations or true variations. Variability may be of two kinds—slight fluctuations which are not transmissible, and true variations or mutations which are transmissible. From DeVries's experiments we know that, after a standstill of more or less prolonged duration, progressive evolution may occur suddenly and definitively with great strides. This may be the explanation for the wonderful advances made by foreigners in this country. But evolution by mutations does not necessarily have to be by leaps and bounds. The

greater the utility of the qualities which have their potentiality in both male and female germ-cells, the greater the racial progress as determined by the offspring. The isolation theories mentioned earlier in this paper under biological fundamentals, if applied here, show us that by in-and-in breeding a race can advance or degenerate very rapidly, by real leaps and bounds. Interbreeding between the higher and lower species lowers the higher and raises the lower species in the scale of progressive evolution. Germ selection is, therefore, the

FIG. 4.



Galton's law of ancestral inheritance. (After Dana.[11])

only true selection for racial progress. Are all our efforts in the direction of improving and educating poor stock of no real, permanent value to society and to future generations?

4. *Mendelism Applied to Man*

Theoretically, Mendel's law should be true in the case of man. Has it been proven so?

In its application to man we must understand that the total inheritance of an individual is divisible into unit characters. Each such unit character is inherited absolutely independently of all the rest, its inheritance being dependent upon the existence or non-existence in the germ-plasma of a purely hypothetical

unit of substance called a determiner. Any given characteristic may be dominant to normal (plainly manifest in the individual) because of the presence in the germ-plasma of its determiner, or recessive to normal (not appearing in the individual) because of the absence in the germ-plasma of its determiner. Therefore, in considering any definite characteristic, an individual may inherit it from both parents (which makes him pure bred) or from one parent (which makes him hybrid). A pure-bred dominant is a case of duplex inheritance; a hybrid is one of simplex inheritance; and a pure recessive, devoid of the character for full, normal development, is nulliplex. Let nulliplex be designated by RR, simplex by DR, and duplex by DD. Then with reference to any given characteristic we have six possible matings with resulting offspring as follows:

1. RR + RR = RR, or all offspring nulliplex.
2. RR + DR = RR + DR, or one-half nulliplex and one-half simplex.
3. RR + DD = DR, or all simplex.
4. DR + DR = DD + 2DR + RR, or one-fourth duplex, one-half simplex, and one-fourth nulliplex.
5. DR + DD = DD + DR, or one-half duplex and one-half simplex.
6. DD + DD = DD, or all duplex.

As an illustration, take the case of imbecility, which is a recessive condition, inasmuch as the power or determiner for full, normal development is not present in a normal degree. If, as in 1, both parents are pure bred imbeciles, all the offspring will be imbeciles; if, as in 2, one parent is a pure bred (inherited from both sides) imbecile and the other a hybrid normal (inherited from one side), the offspring are one-half pure bred imbeciles and one-half impure or hybrid normals (these latter themselves appear normal, but are capable of transmitting the disease to their children); in 3, with one parent pure bred imbecile and the other pure bred normal, all the offspring are hybrid normal; in 4, with both parents hybrid normal, the offspring are one-fourth pure bred normal, one-half hybrid normal, and one-fourth pure bred imbecile; in 5, we have one parent hybrid normal and the other pure bred normal, with offspring one-half pure bred normal and one-half hybrid normal; and lastly, in 6, where both parents are pure bred normal, all the offspring are pure bred normal. And so it is with any other hereditary trait, physical or mental, normal or abnormal. Thus, by knowing whether a given characteristic is dominant or recessive, and by a knowledge of the parental history for two generations, we can say which matings are fit (because of desirable or normal qualities) or unfit (because of undesirable or abnormal or pathological qualities), and the degree of such fitness or unfitness.

The facts of variation and heredity have been proven for all forms of life other than man. In the case of plants and animals new races can be built up to order. Man can create and establish new and valuable varieties. Wheat can now be made to order. A variety of wheat has been produced combining some valuable trait from several other varieties. Special kinds of cotton, of corn, and of sheep can be obtained—pure varieties breeding true. So it is throughout the plant and lower animal kingdoms. Do these laws apply to man?

Although we cannot experiment with man or definitely control his actions in any respect, especially in the matter of mating, we can observe experiments made at random by nature upon man. We can keep records of our observations, tabulate and measure the results. Thus the knowledge of human heredity is

largely of the statistical sort. Mendelism itself is new. Its application to man is newest and latest. Mendelism deals with units. Most human traits are complex. In human heredity we must consider mental as well as physical characteristics. Psychic inheritance is especially peculiar to man and a new factor. An individual may be pure bred in some characteristics and hybrid in others. Surely none of us are pure bred or hybrid in all characteristics. Before a true study of inheritance can be made most of our complex human traits must be analyzed into their units. This is especially difficult with psychic traits, for the psychologist has not yet been able to analyze into their fundamental units even the more common and simple psychic traits. Consequently, although many human traits are already known to Mendelize, most of these are abnormal and pathological, but little having as yet been proven concerning the inheritance of most of man's normal traits, especially in the mental and moral fields. Nevertheless, it certainly seems probable that Mendelian principles are applicable to mental and moral traits, although here the moulding influences of training, education, environment, and tradition are very much greater than in the case of physical characters. Many of these complex traits may even act as units.

In examining human pedigrees for Mendelizing traits we cannot expect in complex and successive generations to obtain typical Mendelian fractions and ratios. Since we are examining but a limited number of individuals, we can obtain but an approximate ratio. Therefore such pedigrees illustrate the nature rather than the laws of heredity.

In what human characters has Mendelian inheritance already been proven? The most clearly established Mendelian character in man is eye-color, in which brown is dominant over blue, owing to the presence or absence of pigment on the anterior surface of the iris. We may also enumerate the following, which seem to follow Mendelian lines: color-blindness, hair color and curliness, albinism, brachydactylism, syndactylism, polydactylism, keratosis, hæmophilia, congenital stationary night-blindness, certain forms of deaf-mutism and cataract, and Huntington's chorea.[9] Pathological traits seem in the main to be dominant. Retinitis pigmentosa, albinism, and alkaptonuria seem to be recessive. Hæmophilia is peculiarly "sex-limited," being dominant in the male and recessive in the female, and is, therefore, transmitted through the female but affects the male.

Many forms of nervous and mental disease, such as chorea, hemicrania, extreme nervousness, epilepsy, manic-depressive insanity, imbecility, and feeble-mindedness are certainly hereditary, although not definitely according to Mendel's law. Goddard[12] concludes that feeble-mindedness is hereditary in sixty-five per cent. of the cases. The work of Rosanoff, Cannon, and Orr[13] seems to show that the neuropathic constitution is recessive to normal, that various clinical manifestations bear to one another the relationship of various degrees of recessiveness (for example, recoverable psychoses, though recessive to normal, are dominant over epilepsy and allied disorders) or of neuropathic equivalents (by which are meant "conditions of the same degree of recessiveness varying in their clinical manifestations with the personality of the subject, environmental conditions, etc."). "Neuropathic constitution," as used here, includes imbecility, feeble-mindedness, epilepsy, deteriorating psychoses, periodic psychoses, paranœic conditions, involutional psychoses, the slighter psychopathic states, and certain eccentricities. Davenport and Weeks[14] come to the same conclusion in the case of epilepsy and allied disorders. Even the susceptibility to pulmonary tubercu-

losis is considered by some to behave as a Mendelian dominant in many cases, but it is not known whether or not it mendelizes.

At this point a very suggestive footnote by Karl Pearson[15] seems to me to be a timely quotation:

"We are at present only reaching light on what is a very important principle, namely, that stocks exist which show a general tendency to defect, taking one form in the parent, another in the offspring. Neuroses in the parents become alcoholism or insanity in the offspring. Mental defect may be correlated with tuberculosis, albinism with imbecility; and one type of visual defect in the father be found associated with a second in the son. We cannot at present give this fact scientific expression, but it would appear that there is something akin to germinal degeneracy which may show itself in different organs. The solution, perhaps, lies in a tendency to general defect in the gamete. Even now I doubt whether it is absolutely unscientific to speak of a general inheritance of degeneracy."

Certainly much of the work along this line tends to support this statement to a surprising degree.

Heredity is the general resemblance between parents and offspring. And, in general, when speaking of the inheritance of insanity, blindness, heart-disease, etc., no particular form of same is meant, but the general tendency to develop it in some form or other. The particular forms in which they present themselves are acquirements, dependent upon the life-experiences of the individual. If, as in the case of instability of the nervous system, a general hereditary mental weakness exists, whether it assumes the form of idiocy, imbecility, feeble-mindedness, insanity, criminality, prostitution, inebriety, etc., depends largely on environmental influence, although a tendency to develop in a particular direction may also exist, but can be greatly or wholly, sometimes not at all, overcome by proper, directive environment, training, and discipline. In conclusion we may say that numerous pedigrees have been found in which ability or unsoundness in general shows a distinct hereditary transmission.

5. *Biometry*

We have seen that most of the statements with reference to human heredity are of the statistical or biometrical and not the individual sort. Biometry deals with the individual merged in with the crowd—with the group; whereas, fundamentally, heredity, to be definite and significant, should consider the individual, which is just what Mendelism does. Nevertheless, although the statistical, biometrical formula has a greatly limited value, yet, in the absence of the more widespread application of Mendelism, it is still necessary and useful in the study of pedigrees from the eugenic standpoint, permitting us to study inheritance of certain characteristics in the group or class. Let us, therefore, invade the field of biometry.

Karl Pearson, who is the foundation head of the eugenic movement in England, has for years been applying biometric methods to eugenic studies. Most of the biometrical results given here are taken from Pearson.

When "two quantities or characteristics are so related that fluctuations in one are accompanied in a regular manner by fluctuations in the other,"[16] they are said to be correlated. This applies to the same characteristic in two series of individuals (as, for example, stature of fathers compared with stature of sons)

as well as to two or more different characters in a single series of individuals (for instance, the relationship between tuberculosis and mental defect in the same group). By obtaining what he calls the "coefficient of correlation" he compares these measured results and draws certain conclusions.

The defects of this method are obvious. This correlation may be due to a causal relationship, direct or indirect, between the characters under consideration, or both may result from a common antecedent condition or cause. Besides, a very serious defect in this method is that it considers the relation between the children and one parent but not both parents, the latter really being essential because it is the actual condition. In addition, since we do not yet positively know just what is due to the heredity and environment respectively, we must not be too hasty in our conclusions.

By a comparative study of such statistical tables Pearson[16] concludes that from fifty-five to seventy-five per cent. of deaths in man are due to natural selection, the other twenty-five to forty-five per cent. of deaths being non-selective and due to the partly random character of death's aim; that Galton's laws of ancestral inheritance and filial regression are approximately correct; and that "not only physical but psychical characters and even morbid and pathological constitutions," in fact, "all human qualities are inherited in a marked and probably equal degree." There is a selective birth-rate by virtue of which the weaker stock is removed "before it has had any, or its full quota of offspring," so that there is a natural tendency toward extinction of the weaker, more unfit stocks. Alcoholism and the vices of civilization seem to occur in marked association with insanity, feeble-mindedness, deaf-mutism, criminality, and generally defective stocks.

This selective death-rate results in an unstable character of human society. By statistics he proves to his own satisfaction that the more short-lived the parent, the greater the death-rate in the offspring, while the more long-lived the parent, the lower the death-rate in the offspring. It is the large families which are responsible for the next generation. The mean or average family is about 4.2 children. Half have less, half have more than 3.3 children. He calls the former subfertile and the latter superfertile, and, based on his statistics, concludes that fifty per cent. of the subfertile parents provide only about twenty-five per cent. of the next generation, while the superfertile parents supply seventy-five per cent. of the next generation. In general, Parson says, fifty to sixty per cent. of those born leave no offspring. Thereupon he lays down the following law:

"Fifty per cent. of the married population provide seventy-five per cent. of the next generation. The same rule may be expressed in another way: fifty per cent. of the next generation is produced by twenty-five per cent. of the married population, or about twelve per cent. of all individuals born in the last generation provides half the next generation. This is not only a general law, but it is practically true for every class in the community."

The nature of a community, therefore, depends largely on the selective death-rates, selective birth-rates, and the selective marriage-rates. In nature there is "no organic correlation between fertility and intelligence," so that the physically inferior and mentally deficient are not naturally more fertile than those stronger in body and mind. Yet we find that man has artificially produced the present condition of relatively greater fertility among the lower classes, thus tending to racial degeneration. "Lower," as used here, refers to consti-

tutional inferiority, physical or mental, which makes an individual of less civic worth.

Pearson shows that there is a greater net birth-rate, a greater marriage-rate (and that, too, at a relatively younger age), and a higher rate of reproduction (fertility rate) among the lower classes, while the death-rate, especially in infants, is selective—that is, it is higher among the lower classes, but not proportionately compensatory. We do our utmost, Pearson warns us, to "interfere with nature's method of purification." We are trying, he says, in the case of nature's end-products to reduce the selective death-rate "by legislation, municipal hygiene, state support, medical progress, and unlimited charity, thereby permitting a high birth-rate and a heavy death-rate."

Instead of encouraging a high birth-rate and suspending the selective death-rate, should we not, asks Pearson, rather assist nature and hasten progress and evolution by lessening the birth-rate and the death-rate by the application of eugenic principles? Natural selection has played a great rôle in man's progress in the past. Science has made man more humane, broad-minded, and sympathetic. This sympathy should not be unrestrained, but guided by reason and fixed laws. There is antagonism between individual comfort and race welfare. Higher civilization tends to suspend the drastic struggle for existence and the survival of the fittest. The lowest fertility is found in the best stocks; the highest fertility in the degenerate stocks in whom the degree of appreciation of the responsibilities of marriage is at its lowest. The infant mortality, though selectively high among the most fertile and lowest classes, does not compensate for their markedly predominant fertility. It is the small family of sound stock which must bear the burden of the large family of unsound or degenerate stock.

Must advancing civilization, cries Pearson, of necessity be associated with increased degeneracy, or is high civilization compatible with racial purgation and progressive evolution? What is the remedy for degeneracy?

Before endeavoring to answer this very difficult question, which is the object of practical eugenics, let us first inquire whether there are at present any indications of national decadence.

6. *Are There at Present Any Indications of National Decadence?*

To determine this let us take a bird's-eye view of the defective, dependent and delinquent classes.

In Great Britain,[19] where from certain quarters there is a great hue and cry that the nation is degenerating, the census of 1901 shows 484,507 mental defectives of all kinds, or one in eighty-five. If the truth were known it is more probably one in fifty. In Scotland there was an increase in the insane of 190 per cent. since 1858, while the population has increased by only fifty-two per cent. In Great Britain, in 1901, "of the 60,000 and more idiots, imbeciles, and feeble-minded, nearly 19,000, roughly one-third, were married and free to multiply; and as for that matter a great many of those unmarried are known to have been prolific."[20] In 1901 Great Britain had 117,000 insane, of whom 47,000, or more than one-third, were married.

But as eugenics is greatly a national question, for we have different conditions to deal with in each country, how do things stand in our own United States? Our census reports show us that we have had an increase in prisoners from 6,737 in 1850, with a population of 23,000,000, to 100,000 in 1904, with

a population of 80,000,000, thus showing an increase from 29 per 100,000 in 1850 to 125 per 100,000 in 1904. Kellicott says that it is believed that of the total number of prisoners actually about one-tenth are in prison at any one time. The number of murders and homicides has trebled in the last fifteen years, the averages for the five years from 1888 to 1889 inclusive and 1902 to 1906 inclusive being 38.5 and 110 per million respectively.[15]

In the census of 1880 we had a total of 91,959 insane, of whom 40,942 were in hospitals and 51,017 not in hospitals, the ratio being 183 per 100,000. In 1903 we had 150,151 insane in hospitals and at least 30,000 more not in hospitals, making a total of not less than 180,000, or 225 per 100,000.[16]

At present in the United States it is estimated that in our 42 institutions for feeble-minded, 115 schools and homes for deaf and blind, 350 hospitals for the insane, 1,200 refuge homes, 1,300 prisons, 2,500 almshouses, and 1,500 hospitals, there are 300,000 insane and feeble-minded, 100,000 blind, 100,000 deaf and deaf and dumb, 100,000 prisoners, with no one knows how many thousands of criminals not in prison, 23,000 juvenile delinquents in institutions, 100,000 paupers in almshouses and out, of whom two-thirds have children and are also mentally and physically defective, and 2,000,000 annually cared for by hospitals, dispensaries, and homes. These form three to four per cent. of our population, or, to put it broadly, one in thirty defective, dependent, or delinquent.[17]

It is said that figures frequently don't prove anything, they are so often misleading. And I will readily admit that we may not be able to state positively whether or not and to what extent there has been an actual relative increase in their number amongst us, although this really seems to be the true state of affairs. But there most assuredly has been an absolute increase in their number. They have more than held their own in numbers with the increasing population.

Of course heredity is not the cause of all this disease, crime, and defect. Nor is environment the cause of every form of degeneracy. We cannot say that any single factor is, for there are several associated causes. Venereal diseases and the infant mortality affect alike the fit and the unfit. But when we appreciate that disease has been lessened, expectation of life prolonged, the infant mortality lowered, social conditions and the general environment bettered, and yet the stream of degeneracy, even though not positively increasing, continues to remain highly prevalent, are we not justified in seeking the cause?

Physical unfitness and disease are no doubt partly responsible for the prevalence of the socially incompetent, for, in spite of improved environment and advance in sanitation and preventive medicine, their numbers have increased owing to the preservation and protection rightly afforded them by society.

But I want to call attention to the fact that just as in the insane, so also, in the broad conception, essentially and fundamentally, it is a mental and not a physical trouble that confronts us in the criminal, the pauper, the prostitute, the inebriate, the idiot, the imbecile, the feeble-minded, certain special cases of deaf and dumb and blind, the epileptic, the psychopath, and in the whole group of cases on the borderland between mental normality and abnormality. Thus the chief cause of the present indications of degeneracy is mental or moral deficiency or inadequacy.

In viewing this prevalence of pathological mental types, remember that the future development of man will be along mental and moral rather than physical

lines. Consequently, even if it be true that the defective, dependent, and delinquent are increasing not at all or in such numbers as to give no real indications of national degeneration, should we not ask whether we must forever see about us these signs of degeneracy, poverty, and misery? Cannot this constant flow of defectives and degenerates be checked? And, yet again, if the race is not receding, is it advancing or merely standing still?

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(To be continued in June issue)

AN ACCOUNT

OF

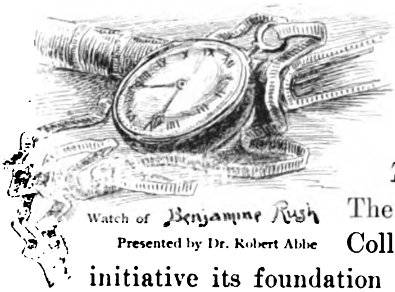
THE COLLEGE OF PHYSICIANS

OF PHILADELPHIA

BY

G. E. DE SCHWEINITZ, A M., M.D.

PRESIDENT OF THE COLLEGE



Watch of Benjamine Rush

Presented by Dr. Robert Abbe

The Origin of the College of Physicians.—The prototype of the College was the Royal College of Physicians of London, but to whose initiative its foundation is due is not definitely known. Doubtless to more than one man this credit belongs.

As early as 1767 John Morgan made proposals to Thomas Penn for the erection of a College of Physicians. These proposals, however, failed to meet with favorable reception and a charter was refused. A number of Philadelphia physicians, who subsequently became Fellows of the College, went, after their graduation from the Medical School of the College of Philadelphia (later the University of Pennsylvania), to Edinburgh for the completion of their studies. It is not unlikely that the success of the society in that city stimulated them, as Weir Mitchell suggests, to imitate it here. Moreover, these physicians naturally formed friendships with influential men in Scotland and England, and doubtless, in the correspondence which subsequently was carried on between them, the foundation of a College of Physicians was frequently broached. Indeed, Samuel Powell Griffitts, writing in 1783, expressly states that the idea of an American College of Physicians had several times occurred to him. Dr. Ruschenberger's researches indicate that the College of Physicians was not actually instituted until September, 1786, the first election of officers having been held in October of the same year.

Drawings by Erwin F. Faber. Photographs by Joseph N. Pearce.

But the first meeting after its full organization, at which nine senior and four junior Fellows were present, did not take place until January 2, 1787, and this day, therefore, by common consent, is regarded as its official birthday.

The minutes of this meeting record that the officers of the College were: President, John Redman; vice-president, John Jones; treasurer, Gerardus Clarkson; secretary, James Hutchinson; censors, William Shippen, Jr., Benjamin Rush, John Morgan, and Adam Kuhn. "A fair copy" of the constitution was signed by the members present, and the publication of this constitution in the *Pennsylvania Packet and Daily Advertiser,* February 1, 1787, was authorized. One month later, at the stated meeting of the College, the secretary reported that the constitution had been published as directed. A device for a seal was submitted and, slightly modified, was adopted so as to read *non sibi sed toti.* The seal was ordered to be cut with this legend: "Sigillum Collegii Medicorum, Philadelphia Institut., A. D., MDCCLXXXVII."

JOHN REDMAN
First President, 1786–1805

Objects and Composition of the College.—The Constitution of the College of Physicians thus signed, sealed, and published records that "the objects of this College are, to advance the Science of Medicine, and thereby to lessen Human Misery, by investigating the diseases and remedies which are peculiar to our Country, by observing the effects of different seasons, climates, and situations upon the Human body, by recording the changes that are produced in diseases by the progress of Agriculture, Arts, Population, and Manners, by searching for Medicines in our Woods, Waters, and the bowels of the Earth, by enlarging our avenues to knowledge from the discoveries and publications of foreign Countries; by appointing stated times for Literary intercourse and communications, and by cultivating order and uniformity in the practice of Physick."

This document further directs that the College shall consist of

William Shippen
President from 1805 until 1808

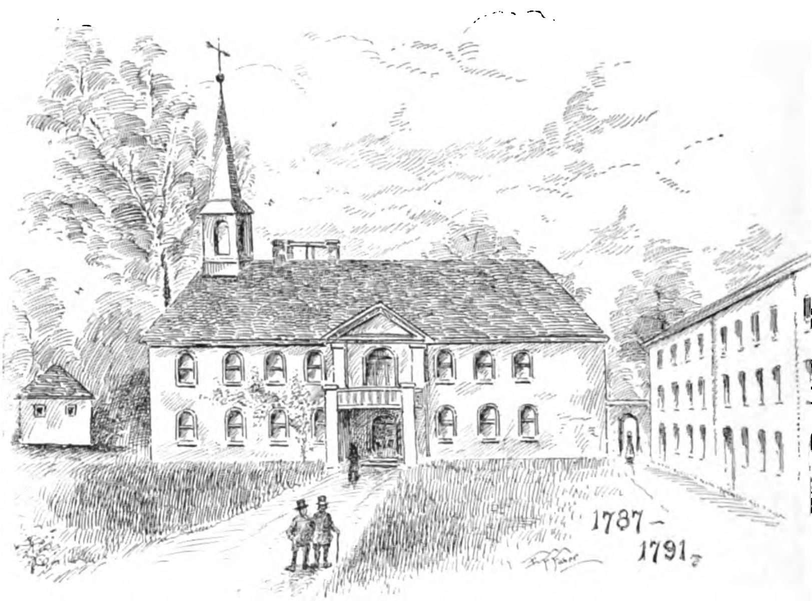
twelve senior Fellows and an indefinite number of junior and associate Fellows; the senior and junior Fellows to be chosen from physicians who resided "in the City or District of Southwark or Liberties of Philadelphia," and the associates to be selected from "such persons of merit in the profession of medicine" who did not live within these described limits. The senior fellowship of the College was maintained by the elevation of juniors within one month after a vacancy was declared. Thus the juniors, in the language of Frederick P. Henry, formed a waiting list, and while they waited doubtless the censors, of whom there were four, as there are now, made sure that there had been no transgression "of good moral character and decent deportment," which Rule 4 prescribed as a *sine qua non* of eligibility. This distinction between senior and junior Fellows was not long maintained, and the amended form of Constitution adopted November 6, 1787, directs that "the College shall consist of Fellows and Associates." This amended Constitution has been signed by every Fellow of the College since its adoption on the date named.

Two years after the foundation of the College, Richard Peters signed, by order of the House of Representatives of the Freemen of the Commonwealth of Pennsylvania, An Act for the Incorporation of the College of Physicians, which declares that "the members of the said College of Physicians be, and shall be, a body corporate and

Adam Kuhn
President from 1808 until 1818

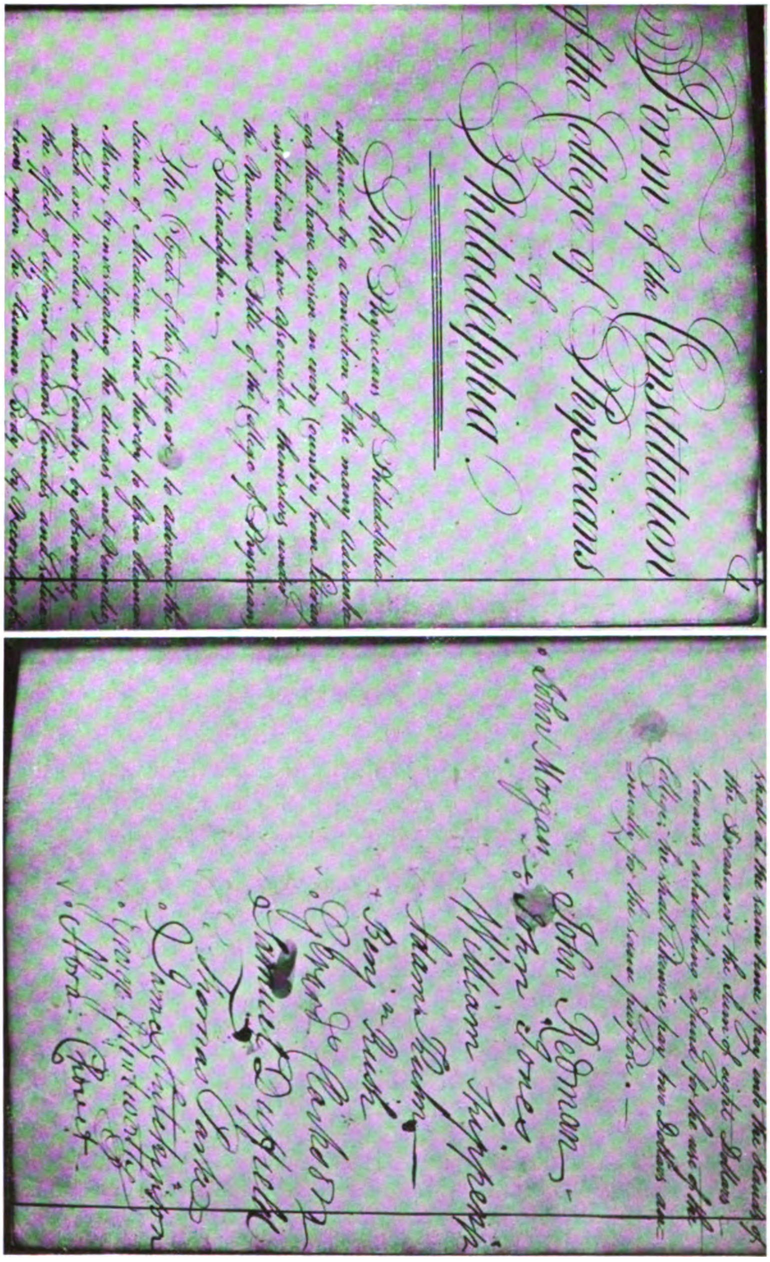
politic in deed and in name, by the name and style of 'THE COLLEGE OF PHYSICIANS OF PHILADELPHIA.'" In Philadelphia, on Thursday, the 26th of March, 1789, this charter was enacted into a law.

The name College was chosen with the understanding that it should have the same significance it had in Roman law: a number of persons associated together by possession of common functions, *i.e.,* a body of colleagues. Benjamin Rush, in the first paper which he read before this collegiate body on February 6, 1787, said: "By



FIRST HOME OF THE COLLEGE OF PHYSICIANS IN THE OLD COLLEGE OF THE UNIVERSITY OF PENNSYLVANIA

assuming the name of a College, we shall first be able to introduce order and dignity into the practice of physic, by establishing incentives and rewards for character. Men are generally anxious to preserve the good opinion of those with whom they are obliged to associate. The reception we shall meet with from each other in our meetings will serve to correct or to improve our conduct. And if we are as chaste as we should be, in the admission of members, a fellowship in our college will become in time not only the sign of ability, but an introduction to business and reputation in physic."



Form of the Constitution of the College of Physicians of Philadelphia

The Physicians of Philadelphia influenced by a conviction of the many advantages which have arisen in every Country from Literary institutions, have associated themselves under the Name and Title of the College of Physicians of Philadelphia.

The Objects of this College are to advance the Science of Medicine, and thereby to lessen human Misery, by investigating the diseases and Remedies which are peculiar to our Country, by observing the effects of different Seasons, Climates and situations upon the human Body, by ...

shall at the same time pay into the hands of the Treasurer the sum of eight Dollars towards establishing a fund for the use of the College; he shall likewise pay two Dollars annually for the same purpose.—

John Redman
John Jones
William Shippen
Adam Kuhn
Benj. Rush
Gerardus Clarkson
Samuel Duffield
Thomas Parke
James Hutchinson
George Glentworth
Abrm. Chovet
John Morgan

A PORTION (BEGINNING AND END) OF THE ORIGINAL CONSTITUTION OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA, WITH SIGNATURES OF THE ORIGINAL SIGNERS

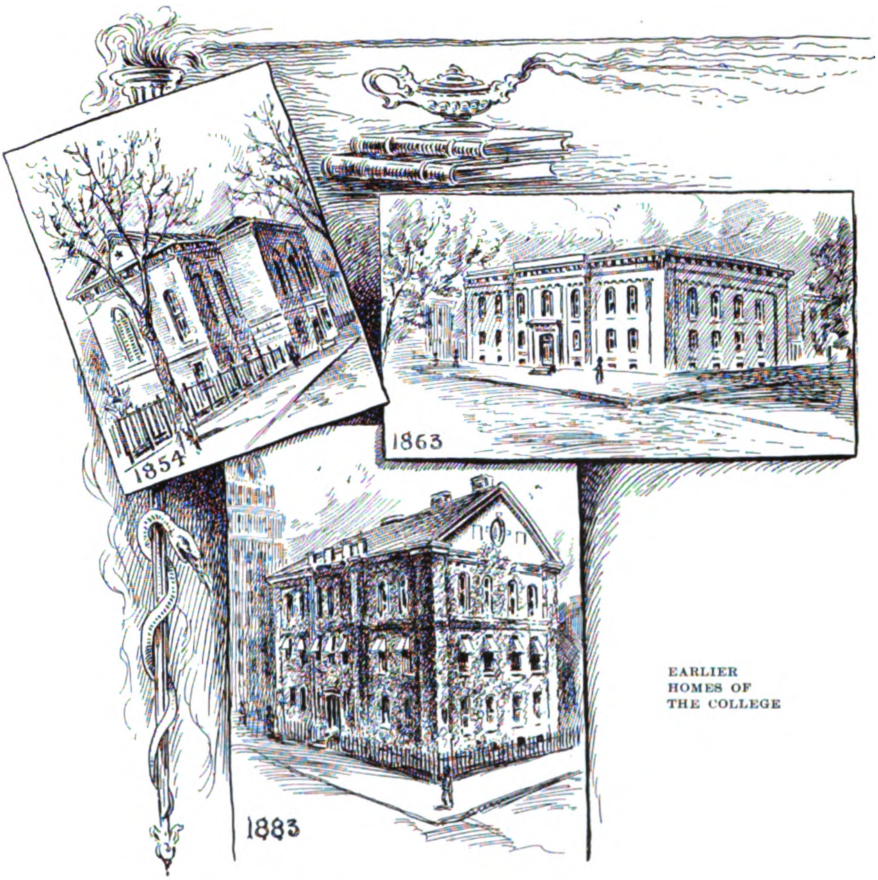
The College never has been a teaching institution in the ordinary sense of that term, nor has it the power to confer degrees. It has the right only to bestow Fellowship and Associate Fellowship upon those who are eligible for these honors and to elect a limited number of Corresponding Members. This Collegium, therefore, is a scientific body, and once a month, except during July, August, and September, meetings are held at which papers on medical, surgical, and allied subjects are read and discussed. These communications are published in the *Transactions,* the first volume of which appeared in July, 1793.

Between November, 1841, and January, 1850, three volumes of *Transactions* were issued, and in November of this year a new series of the summary of the *Transactions of the College* was begun, and continued until July, 1857. Then an arrangement was made with the *American Journal of the Medical Sciences* by which papers read before the College were published in that journal and separate copies were supplied for the use of the Fellows. This arrangement continued in force until November, 1874. The first volume of the Third Series of the *Transactions* was issued in 1875, and the eighth in 1886. Each year since that date a volume of *Transactions* has been printed.[1]

The first meetings of the College were held in the old Academy at Fourth and Arch Streets in the afternoon of the first Tuesday in each month. Now the meetings take place on the first Wednesday of each month, July, August, and September excepted, at eight o'clock in the evening.

The gatherings of the Fellows of the College have not always been concerned alone with the discussion of scientific matters, but,

[1] Other publications of the College during this period have been the following: "The Proceedings of the College of Physicians Relative to the Prevention of the Introduction and Spreading of Contagious Diseases," a pamphlet published in 1798; "Facts and Observations Relative to the Nature and Origin of the Pestilential Fever which Prevailed in this City in 1793, 1797, and 1798," a pamphlet published in 1800; Dr. Wistar's Eulogium on Dr. William Shippen, delivered in 1809 and published in 1818; Dr. Rush's Eulogium on Dr. William Cullen, delivered July 9, 1790; "An Essay on the Yellow Fever of 1762 in Philadelphia," by Dr. John Redman, read September 3, 1793, and printed in 1865; "The Charter, Constitution, and By-laws of the College of Physicians," printed privately for the use of the Fellows in 1790, the last edition being that of 1900. Additional publications will be found mentioned in the Bibliography.



EARLIER HOMES OF THE COLLEGE

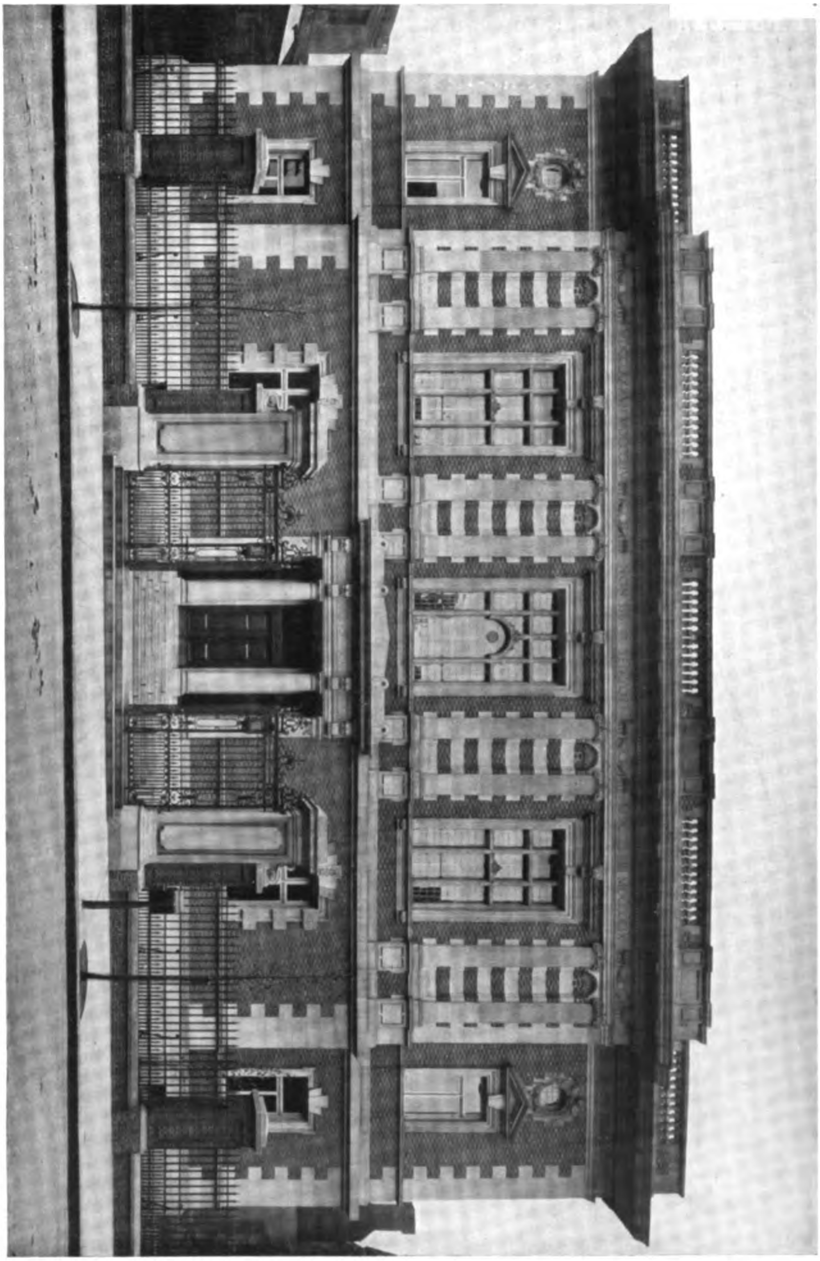
in the language of Dr. Tyson, "The College early assumed a guardianship over the health, safety, and even the morals of the community." The first standing committee, that on Meteorology and Epidemics, was appointed March 6, 1787, and it presented a yearly report until it was abolished in November, 1882, a period of 95 years.

From 1793 until 1798 yellow fever prevailed in Philadelphia. Indeed, from 1793 until 1806 no year was entirely free from its baleful influence. During this period the Fellows of the College were active in their labors, giving freely of their service in attendance on the sick and suffering, and of their time in frequent conferences among themselves that they might, working in conjunction

with the city and State authorities, devise means and ways for checking the progress of the epidemics. Unfortunately, these conferences were far from harmonious, some of the Fellows believing that the disease was of local origin and others that it had been imported, and each faction maintained its opinion in vigorous and often acrimonious debate. So, too, differences of opinion arose between the Fellows and the members of the Board of Health, especially as to the etiology of the disease, the pathway of contagion, the value of public notification and the need of quarantine. In spite of these disturbing elements, much good was accomplished, and all of the Fellows of the College, no matter what their individual opinions may have been, were untiringly brave in the performance of their duties. Two founders of the College died of the disease, and others were seriously ill. Even as late as 1820, when yellow fever for the last time visited Philadelphia, the College through its committees urged the view which it had adopted originally, namely, that the disease was imported and that it spread by contagion.

During the earlier years of its existence the activities of the College pertaining to the maintenance of public health and the improvement of public morals were noteworthy. For example, its appointment in 1787 of a committee to submit plans for establishing cold and hot baths and a botanical garden for the city; its consultation with the State Legislature over the spread of infectious diseases in 1789; its consideration in 1794 of "the regulation of the practice of physic within the State," and of the establishment of a quarantine and a hospital for contagious diseases at the request of the various authorities concerned; its work in conjunction with the Board of Health of the city in the management of the epidemic of cholera in 1788; its memorialization of the State Legislature in 1787 and of the Congress of the United States in 1790 on the deleterious effect of alcohol on the human system and the need of laws regulating its consumption; and its important actions in relation to the preparation of the Pharmacopœia of the United States, begun in 1788. In each decennial revision of this work the College has taken an active part.

Always ready to maintain proper regulation of animal experimentation, the College has been insistent that experiments upon living animals are an absolute necessity in scientific work. In this



NEW HALL OF THE COLLEGE OF PHYSICIANS

respect, especially since 1885, when the College first sent a remonstrance to the Legislature against a bill to prevent such experiments, it has proved to be a veritable research-defence society, with the sole object in view, as Sir William Osler would say, of keeping the field

MAIN STAIRWAY WITH STATUE OF ÆSCULAPIUS.

clear for the free advance of science in the interests of our fellow-creatures.

Space does not permit an elaboration of the important work which the College has performed in its efforts to prevent pollution of the water supply of the city, in its insistence upon the regis-

tration of births and deaths, in its urging the passage of laws for the inspection of drugs, in its aid in early days in the regeneration of the Board of Health of this city, in its protest in 1855 to the Legislature against a bill the effect of which would have been to put the educational interests of the profession into the hands of politicians, and in its labors to stimulate the enactment of laws to lessen the dangers of dispensing poisonous medicines.

ENTRANCE TO THE HUTCHINSON RECEPTION ROOM

Although in recent years the College in its deliberations has confined itself in largest measure to the discussion of scientific matters, and has shown less inclination than in former times to take an active official part in public affairs, doubtless due, as the honorary librarian points out, to the rise in influence in these particulars of the county and State medical societies (and it was largely influential in 1848 in aiding the formation of the Medical Society of Pennsylvania), it has by no means entirely disregarded them, and from time to time is consulted in these respects. It has been active, for

example, in discussions relating to the registration and reporting of pulmonary tuberculosis, in measures for the regulation of infectious diseases, and in paying strict attention to quarantine laws. It maintains a representative on the State Quarantine Board who presents a triennial report.

The College at present is, as it was in the past, always ready to be consulted and to give advice in matters pertaining to the welfare of the community. A good example of this is the careful investigation made by a committee appointed by the president of the College, with the authority of its Council, at the request of the Commissioner of Health of the Commonwealth of Pennsylvania, to consider the propriety of the free distribution by the various county societies of antitetanic serum.

To only a few of these public-spirited works of the College has it been possible to make reference. They constitute, as Dr. Stillé has said, an imperfect catalogue, but " they indicate the sympathetic interest of the College in whatever concerned the progress and interests of medicine and the welfare of the community."

The Library.—Of the many achievements of the College, the establishment of its library, which now has a prominent position among the great medical libraries of the world, must take place in the foremost rank. First formally considered in June, 1788, the library actually began in the donation by Dr. John Morgan of 24 volumes. It is not possible, nor indeed necessary, in this account to record in detail the gradual acquisition of books, nor to speak of the periods of time when the library was little used, when its development was puny, and its existence was threatened. These have been well described in the communications by Charles Perry Fisher, Dr. James Tyson, and Dr. Frederick P. Henry.[2] At first books came in slowly, the gift of individual Fellows, who also gave money for the purchase of books, and certain sums in this respect were appropriated by the College. In 1819 the collection of books had grown of sufficient importance to require a catalogue. Six years later the library of the Kappa Lambda Society was acquired, in 1848 the Otto collection was purchased, and in the next year the library obtained a number of books from various Fellows, particularly

[2] See first footnote and bibliography.

from Drs. Bond, Condie, Parrish, and Wood, and was the recipient of many volumes from Mrs. Moreton Stillé. In 1856 the Betton collection was added to its shelves, so that in 1859 the library contained about 4000 volumes and a number of pamphlets. But, to quote from Mr. Charles Perry Fisher, the most important epoch in the history of the library was the foundation of the Lewis Library in 1864, whereby more than 2500 choice volumes in the finest condition were added to the collection. During his life Dr. Lewis gave to this library his constant care and attention, so that at the present time, with the additions which he made and with those made by his many friends, it contains 13,573 volumes.

After this period of time the library rapidly increased in size and importance, and from 1882 until 1902 it acquired the libraries of a number of its Fellows, to wit: those of Dr. Charles D. Meigs, Dr. John Forsyth Meigs, Dr. R. M. Bertolet, Dr. William F. Jenks, Dr. Samuel D. Gross (this is the library of the Academy of Surgery and was accepted as a permanent deposit), Dr. H. Lennox Hodge, Dr. John F. Weightman, Dr. N. Archer Randolph, Dr. Jacob M. Da Costa, Dr. John Ashhurst, Jr., Dr. Alfred Stillé (the major portion of this library was first deposited in the Lewis collection), and Dr. William F. Norris. During this period numerous books were presented by many Fellows, a large collection coming from Dr. I. Minis Hays, and in 1900 nearly 7000 theses and inaugural dissertations were received, and a notable exchange of publications was arranged with foreign universities by the efforts of Dr. W. W. Keen.

In the year 1901, with the aid of liberal subscriptions received from Drs. S. Weir Mitchell, John K. Mitchell, and George Fales Baker, the library of the late Dr. J. Stockton Hough, containing 3247 volumes and 2070 pamphlets, many of the books being of the greatest value and interest, was purchased. Soon after, the College received the library of the late Dr. Thomas M. Drysdale and large gifts of books from the Board of Managers of the Episcopal Hospital of Philadelphia. Through the efforts of Dr. W. W. Keen, Sir William Osler, and Dr. William Landouzy, 940 inaugural French theses were obtained in 1907, and by exchange with the College *Transactions* 40 or 50 volumes of these Paris theses are yearly added to the shelves. Dr. Keen was also most liberal in

his donation of a number of exceedingly rare and valuable medical works, among which 21 are incunabula.

At the present time there are 165 medical incunabula in the library of the College of Physicians—surely a notable collection. The titles of a few of them that command special interest are:

JACOBUS DONDUS PADUANUS. Aggregator Paduanus de medicinis simplicibus. [Strasburg, Adolf Rusch (the "R" printer), circa 1470.]

VALESCUS DE TARANTA. De epidimia et peste. [Circa 1470.] Each of the above books has been credited with being possibly the first medical work printed. Both are extremely rare editions.

MATHEUS SILVATICUS. Liber pandectarum medicinæ. [Argentorati, Joh. Mentelin, circa 1470.]

SIMON GENUENSIS. Synonyma medicinæ s. clavis sanationis. Mediolani, Zarotus, 1473. [First edition of the first medical dictionary. This book and the one following are the earliest dated books in the library of the College.]

BARTHOLOMÆUS METLINGER. Regiment der jungen Kinder. [Augsburg, Zainer 1 1473.] [Second Renaissance contribution to pediatrics.]

BENEVENUTUS GRASSI. De oculis eorumque egritudinibus et curis. Ferrara, Severinus Ferrariensis, IIII [1474]. [First edition of the first book printed on diseases of the eye.]

PEDACIUS DIOSCORIDES ANAZARBEUS. De materia medica. Colle, de Medemblich, 1478. [Said to be the first book printed at Colle.]

PETRUS ÆGIDIUS CORBOLIENSIS. Carmina de urinarum judiciis cum expositione Gentilis de Fulgineo. Padua, Matheus Cerdonis de Vindischgretz, 1483. [First edition, very rare.]

PAULUS BAGELLARDUS A FLUMINE. De infantium ægritudinibus et remediis. [Padua] Mathæus Cerdonis de Vindischgretz, 1487. [Second edition of the first book printed on diseases of children. First edition was published at Padua in 1472.]

ISAAC JUDÆUS. Tractatus particularibus diætis. [Padua.] Mathæus Cerdonis de Vindischgretz, 1487. [First edition of the first book printed on diet.]

BERNARD DE GORDON. Practica dicta lilium medicinæ. Lyon, 1495. [First and only edition in French in the fifteenth century.]

JOHANNES PEYLIGK. Compendium philosophiæ naturalis. Liptzensi, Melchiar Lotter, 1499. [The first book published with anatomical plates of individual organs. These plates of organs were copied from the 1498 edition of Mundinus.]

The following are the titles of a few noted books issued after the year 1500, contained in the College collection.

SYMPHORIANUS CHAMPERIUS. Index librorum in hoc volumine contentorum: Symphoriani Champerii libelli duo. Primus de medicinæ claris scriptoribus in quinque partibus tractatus. [Lugduni, 1506.] [The first edition of the first medical biography, also bibliography, published.]

JOANNES KETAM. Fasciculo di medecina vulgare. [Venetetia, Gregorio de

Gregoriis, 1508.] [Only two copies known of this edition: this and one in the Public Library in Venice-Stockton-Hough, 1900.]

THOMAS GEMINUS. Compendiosa totius anatomie delineatio aere exarata. London [Gemini], 1559. [One of the earliest books on anatomy in the English language, dedicated to Queen Elizabeth, and containing what is said to be the first portrait of this Queen.]

The following essay is an early imprint of our own country:

THOMAS CADWALADER. An essay on the West-India dry-gripes. Philadelphia, B. Franklin, 1745. [One of the rarest American imprints. The only known copy containing two prefaces, one of which was suppressed.]

From statistics gathered of the various editions published of the

CADWALADER HALL

works of Harvey for a paper recently issued by Dr. S. Weir Mitchell, there were found to be represented in the various medical libraries in this country and in Europe forty-two editions, as follows:

Exercitatio anatomica de motu cordis	25
Exercitationes duas*** ad Jo. Riolanum	3
Exercitationes de generatione animalium	10
Opera omnia***	3
Prelectiones anatomiæ universalis	1

The library of the College of Physicians contains 33 of the 42 noted, including the first edition of the "de motu cordis," 1628;

only one other library, the Surgeon-General's Office at Washington, containing as great a number—33.

The library is divided into the General Library, the Lewis Library, the S. D. Gross Library, and the Library of the Obstetrical Society of Philadelphia, and the total number of volumes in this collection is 95,896, to which should be added 8917 unbound theses and dissertations and nearly 90,000 unbound pamphlets.

Naturally, the expense of maintaining so important a collection of books is considerable, and since the commencement of its steady growth, in 1866, the fixed charges against the library have grown greater year by year. These are met by the income from various library funds established by the generosity of Fellows and friends of the College. Certain special accounts—for example, funds for completing files of journals, the Journal Association New Book Fund, the J. Ewing Mears account, and the S. D. Gross Library account—are also income-bearing, while the income of the George B. Wood fund is utilized for the library supplies. But the College is fortunate in the generosity of Fellows and other friends, and the good example set so long ago by John Morgan continues. It would not be possible to name all those to whose generosity the growth of the library is so much indebted, but many volumes have come from Drs. S. Weir Mitchell, J. K. Mitchell, Hare, Keen, Packard, Dulles, Hirst, the late Dr. J. Alison Scott, H. C. Wood, John B. Roberts, and others. Moreover, the prominent publishing houses of Philadelphia have always been most liberal in the presentation of books coming from their presses.

About 3000 volumes are purchased annually with the funds of the College, and many others are donated by the authors, publishers, and friends to whom reference has been made.

It is interesting to note that from 1896 to 1911, 8675 new medical publications in English, French, German, and a few in other languages have been added to the library, and of these 575 were written or edited by Fellows of the College.

The current literature of the day in all modern languages is represented by periodical publications, and at this time the total number of such periodical publications received is 1203.

The library is free, and is open to any one who is interested in the volumes which rest upon its shelves. Only Fellows have the

privilege of taking books from the building, but to any one introduced by a Fellow the same privilege is granted. The advantages of the library are freely utilized; for example, in 1908, more than 12,000 visitors were registered and nearly 23,000 books were consulted. It is unnecessary, as Dr. Henry says, to add to this statement to prove that the College of Physicians possesses a real working library. Its great influence is evident, and it has done much to maintain the well-known literary reputation of the profession of this city in medical matters.

THOMSON ROOM

The Homes of the College of Physicians.—Since the institution of the College on the 2d of January, 1787, until its removal to its present splendid quarters, five homes have sheltered the members of its guild and housed the treasures of its library. These abodes, in the language of Dr. Tyson,[3] were, first, the Academy building on Fourth Street for nearly five years; second, the hall of the Philosophical Society for nearly fifty-three years; third, the Mer-

[3] *Transactions of the College of Physicians,* Third Series, vol. xxx, 1908, p. 226.

cantile Library for seven years; fourth, the Picture House in the Pennsylvania Hospital grounds for eleven years, and, fifth, its own hall at Thirteenth and Locust Streets from March, 1863, until November 10, 1909, when it moved into its present quarters, ordinarily known as the New Hall of the College of Physicians.

As the College increased in influence and membership, it became evident that new surroundings were necessary, and the first building fund was established November 2, 1849, a memorable date in its history. On December 18, 1861, the College determined to begin the construction of the building at Thirteenth and Locust Streets, which was completed and occupied for the first time in March, 1863. The great generosity of Dr. George B. Wood in the erection of this, the first building specially designed for the College of Physicians, must never be forgotten. Here the College remained until November, 1909, but for a long time prior to its removal it was evident that these quarters in the old ivy-twined building, loved and interesting as they were, could no longer adequately store the ever-increasing library nor accommodate the various meetings which took place within its walls. It would not be profitable to describe the various plans which were proposed before finally it was decided to purchase the lot upon which the present College building stands. These discussions lasted for a period of eight years, and after the institution of a third building fund on January 21, 1903 (a second building fund had been begun on April 7, 1875), the lot on 22d Street above Chestnut was purchased on May 29, 1903. The corner-stone of the new building was laid by Weir Mitchell on April 29, 1908, and the building was completed and occupied on November 10 and 11, 1909, and dedicated with impressive ceremonies, lasting for two days.[4]

The erection of this building was in largest measure due to the unselfish and untiring activity of the Funds Committee,[5] to the liberal contributions of the Fellows, and particularly to the energy

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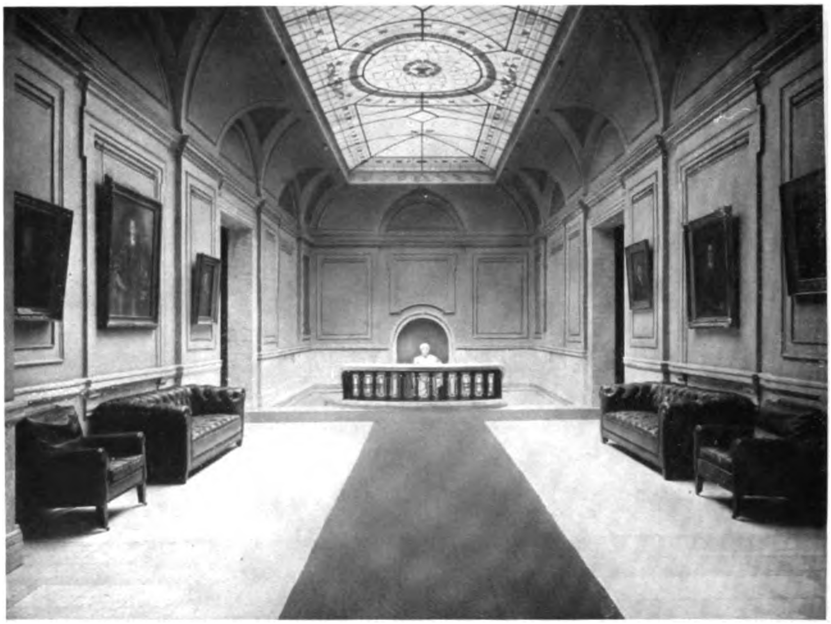
[4] The arrangements of the ceremonies of dedication were successfully carried out by a committee composed of Dr. Charles H. Frazier (chairman), Dr. George W. Norris, Dr. T. Mellor Tyson, the President and Vice-President of the College.

[5] The committee to collect funds was composed of Dr. S. McC. Hamill (chairman), Drs. T. G. Ashton, J. H. Girvin, D. Braden Kyle, David Riesman, Alfred Stengel, G. C. Stout, C. H. Frazier, and the Vice-President of the College.

MÜTTER MUSEUM

and generosity of Dr. S. Weir Mitchell. The contributions thus received, together with the splendid donation of Mr. Andrew Carnegie and the generous financial aid given by Mrs. Frederick Penfield, Mrs. S. Weir Mitchell, Mr. Clement Griscom, Mr. Dunwoody, Mr. Clement Newbold, Mr. W. W. Frazier, Mr. C. C. Harrison, Mr. Frederick Vanderbilt, Mr. Eckley B. Coxe, Jr., and many others, whose names



VESTIBULE LEADING TO MITCHELL HALL WITH DOORS LEADING TO ASHHURST AND NORRIS ROOMS

are gratefully recorded in the *Transactions*,[6] furnished enough of the needed funds to authorize the Building Committee[7] to proceed with the erection of the New Hall, and to spend the sum of money that was indicated as necessary by the plans presented by the architects, Messrs. Stewardson and Jamieson. So satisfactory was the work of this committee that in his final report its efficient secre-

[6] *Transactions of the College of Physicians*, Third series, vol. xxxi, 1909. This volume also contains a full account of the exercises on the occasion of the dedication of the New Hall of the College of Physicians.

[7] The Building Committee was composed of Drs. James C. Wilson, George B. McClellan, J. K. Mitchell, Richard H. Harte, Frederick P. Henry, William J. Taylor, and the President and Vice-President of the College.

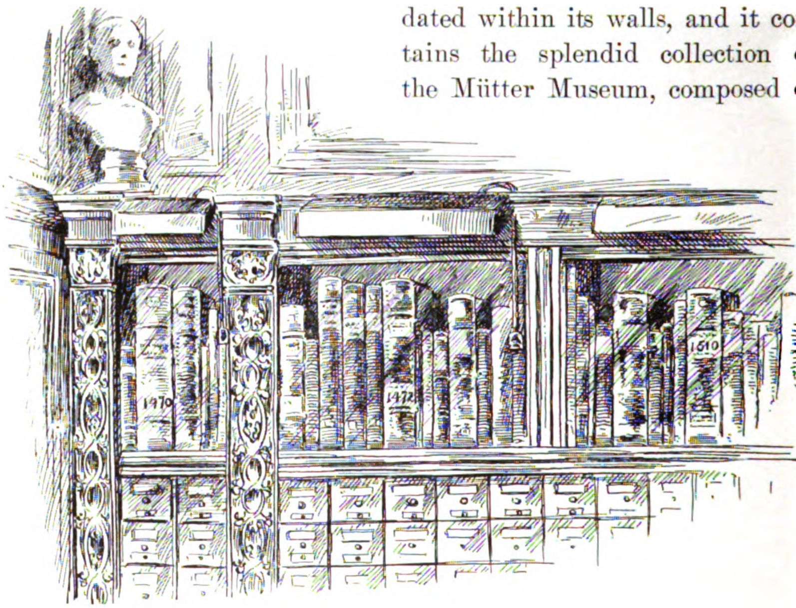
tary, Dr. William J. Taylor, was able to exhibit a balance on the credit page of his ledger. Not only was the building erected according to the plans drawn by the architects and accepted by the Fellows of the College, but with the aid of liberal subscriptions from friends and Fellows of the College the various halls presently to be referred to were furnished in an eminently satsifactory manner. Such indebtedness as remained was neutralized by the generosity of Mr. Edward Stotesbury, in the presentation of a large sum of

ASHHURST ROOM CONTAINING CARD CATALOGUE, INCUNABULA, AND REFERENCE BOOKS

money, given, to use his own words, "to relieve the College from debt and leave it free to pursue its career of honorable usefulness."

The New Hall of the College of Physicians.—Thus it came about that the sixth home of the College of Physicians was erected and occupied. Speaking of this new hall, the Vice-President of the College, addressing the secretary of the Building Committee on the day of presentation, said: "On behalf of the President and officers, and in the name of the Fellows of the College, I have the honor to accept this home, of mark beyond all others, to accept it with pride in the nobility of its structure, with satisfaction in the

amplitude of its unrivalled equipment, and with rejoicing in the completion of its brave and generous plans." It is a home of which the College and its Fellows may well be proud, as indeed may be the citizens of the city of Philadelphia. It affords ample space for the library, it provides the Fellows with adequate reading rooms, it contains large halls suitable for lectures and for regular meetings, not only of the College of Physicians, but of other scientific societies which are accommodated within its walls, and it contains the splendid collection of the Mütter Museum, composed of



INCUNABULA, RARE MEDICAL BOOKS, AND CARD CASE, CORNER OF ASHHURST ROOM

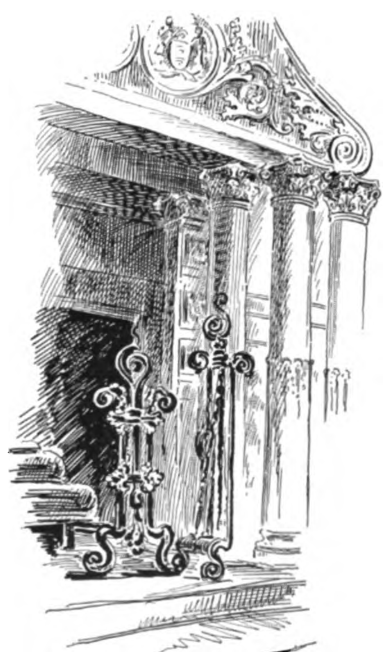
anatomical and other specimens, as well as the offices of the Directory of Nurses and those used by the librarian and his staff of assistants.

The style of architecture is English, of about the end of the seventeenth century, the material is dark-red brick laid Flemish bond, with basement cornices, pilasters, and other trimmings of Indiana limestone. The building itself has a frontage of 108 feet and a depth of 150 feet, and stands upon a lot of ground 130 feet front by 180 feet deep, a lot, therefore, of sufficient size to permit the building to be placed at a considerable distance from the street line on all sides. At the street line is a low brick wall with high

brick posts and an iron railing between them. Through the liberality of friends and patients of the late Dr. John Forsyth Meigs, and under the supervision of Dr. John K. Mitchell, the area between the railing and the building proper has been planted with shrubbery and grass. Owing to the great generosity of Mr. Eckley B. Coxe, Jr., certain unsightly buildings in the neighborhood of the College, to wit, a large stable and three mean houses, have been acquired by the College. These have been razed to the ground, and on the space thus gained there will be erected in the near future a memorial to the late vice-president of the College, Dr. Wharton Sinkler.

To accommodate the library the bookstack was erected, which consists of seven tiers and has a capacity of 300,000 volumes. Although fireproof construction is used throughout, this stack is cut off from the rest of the building by fire doors, and is provided with wire glass windows in metal frames, the windows being protected by rolling steel fire shutters.

The front vestibule and main hallway and staircase are floored and wainscoted with Vermont marble of different shades. The reception hall of the first story is wainscoted to the ceiling with "silver ava," a light gray wood, having been selected with a view to harmonizing with the marbles in the adjoining hall. On the right of the vestibule are the offices of the Nurses' Directory, and on the left the superintendent's office, beyond which, opening to the left, is the Hutchinson reception room, provided by the descendants of Dr. James Hutchinson, and the family of the late Dr. James H. Hutchinson. A broad stairway leads from the first floor upwards, and at its head stands the splendid statue of Æsculapius, a replica of the one in the Vatican, the gift of Dr.


CORNER OF ASHHURST ROOM

Richard H. Harte, treasurer of the College. Beyond, reached by two shorter stairways, is the large vestibule leading into the monumental hall which occupies the front portion of the second story. This is the meeting place of the Fellows of the College and is also a portrait gallery, for upon its walls hang the portraits of the former presidents and vice-presidents of the College. This hall, named Mitchell Hall, in honor of Weir Mitchell, was furnished by the generosity of many friends and Fellows of the College, and particularly by the active interest of Dr. John H. Musser. It has oak wainscoting, pilasters, a deeply coffered, plastered ceiling, and a seating capacity of 500. Its proportions, design, and decorations combine to make this a hall of great dignity and beauty. From its eastern end doors lead into the Ashhurst and Norris rooms, and at the upper end on each side are the entrances to the Wood and Packard rooms. The former was furnished by the Wood family and contains a marble bust of Dr. George B. Wood, the gift of Messrs. Craige, Walter, and J. Bertram Lippincott, and a bronze bust of Dr. Horatio C. Wood, the gift of Messrs. George Wood and George Wood Bacon, its walls being lined with the mahogany book shelves of the late Dr. George B. Wood. The latter was furnished by the brothers of the late Dr. Frederick A. Packard, and in it the Library Committee holds its monthly meetings.

In the lower hall to the right and left are respectively the Thomson and the Cadwalader rooms, the first furnished by the children, nephew, and nieces of the late Dr. William Thomson, and the second by Mrs. S. Weir Mitchell. On each side of the head of the stairway are respectively the Norris and Ashhurst rooms, the first furnished in memory of Dr. William F. Norris, by his children, and by Mr. Charles Norris and Dr. G. E. de Schweinitz, and the second furnished by Dr. Richard H. Harte in memory of the late Dr. John Ashhurst, Jr.

The Norris room contains the periodicals, and upon its shelves, suitably lighted, more than 1200 current periodicals are placed. Also here may be seen many rare editions of old medical works. The Ashhurst room contains the card catalogue and the bound volumes of the most important and actively used medical journals, the only books which are not in the bookstack. In each of these rooms the walls are hung with numerous prints, engravings, photographs and

pictures. Beyond the stairway in the lower hall is the Mütter Museum and its splendid collection. This room is furnished with an iron gallery around three sides, so as to give a large amount of wall space for cases.

An important feature of this new hall of the College of Physicians is the private study room. A large number of these rooms are provided on the second and mezzanine floors, and here the Fellows of the College may work free from interruption and surround them-

NORRIS ROOM, CONTAINING CURRENT PERIODICALS

selves with the volumes which they require in their special researches.

The Cadwalader and Thomson rooms are utilized by various scientific societies, to which they are rented by the Hall Committee of the College; for example, the County Medical Society, the Pathological Society, the Neurological Society, the Philadelphia Academy of Surgery, the Obstetrical Society, and the various Sections of the College itself.

Opening from the left of the northern end of the Hutchinson

reception room is the entrance to the Gross Library, furnished by the Gross family, its handsome bookcases being the gift of Dr. J. Ewing Mears; in this room take place the meetings of the Council of the College. The entire equipment of the building, insofar as heating, lighting, ventilating, vacuum cleaning, pneumatic tubes, electric lifts, and intercommunicating telephone system are concerned, represents the latest and most approved designs.

A large kitchen in the basement makes it possible to give the official dinners of the College in the New Hall. Provisions for these dinners and other social functions arise from the income of the Weir Mitchell Entertainment Fund.

To two adjuncts of the College of Physicians only a brief reference has been made, and therefore a word in regard to them follows: In 1849, at the instigation of Dr. Isaac Parrish, a cabinet of pathological specimens was established, and later a curator was elected and a committee on the museum was appointed. This museum, after thirteen years of healthy growth, was united with the Mütter collection. Dr. Mütter first offered his museum to the College in 1856, but for various reasons the agreement which constituted the transfer was not signed until December, 1858. The various terms of the bequest were carried out as carefully as possible by the College, and for this splendid collection of specimens, casts, oil paintings, water-colors, etc., special quarters were provided in the building at Thirteenth and Locust Streets, where it remained until it was transferred to its present situation in the New Hall. Not only did Dr. Mütter present his museum to the College, but with it came a handsome endowment, and the legacy provides for the appointment once in three years of a lecturer who shall discourse on some subject connected with surgical pathology. The first lecture was delivered March 2, 1864, by Dr. John Packard, and since then this post has been occupied by many distinguished surgeons and pathologists, among whom may be mentioned Dr. Harrison Allen, Dr. John H. Brinton, Dr. S. D. Gross, Dr. E. O. Shakespeare, and Dr. George W. Crile.

The museum itself, under the able management of the committee in charge of it, has grown to fine proportions. The Hyrtl collection of human skulls and preparations by erosion, and the Politzer ear specimens, are among its most notable possessions.

NORTHWESTERN PORTION OF MITCHELL HALL

The museum is open to all research students, medical students, and physicians under proper regulations, and is constantly visited by those whose investigations require the study of its specimens.

At the suggestion of Dr. S. Weir Mitchell, a Directory for Nurses was organized and its first office opened in May, 1882. The income of this directory has usually been in excess of its needs, and therefore its committee has been able to add materially to the funds required in other portions of the College, notably to those of the

THE BOOK STACK

library. The fee formerly asked for furnishing a nurse is now abolished, and, in the language of Dr. Mitchell, the Directory is as free as is the library. Its great use can be described in a sentence, namely, that since 1882 nearly 50,000 requests for trained nurses have been received by its directors.

The College of Physicians administers two prize funds, from the income of which are awarded the Alvarenga Prize and the Nathan Lewis Hatfield Prize. The first of these funds was given

to the College by the late Pedro Francisco Da Costa Alvarenga, of Lisbon, Portugal, who was an Associate Fellow of the College, and the income is awarded to the successful competitor, who may write on any subject in medicine, by a committee yearly appointed.

The deed of trust of the Nathan Lewis Hatfield Memorial Fund is administered by three trustees, and the income, which must never be less than $500, is awarded by a committee appointed triennially

PRIVATE STUDY ROOM

by the president of the College to an essay which must represent original research in medicine.

Since the foundation of the College on January 2, 1787, 935 Fellows, 91 American Associate Fellows, 51 Foreign Associates, and 8 Corresponding Fellows have been elected. The roll-call at the present time is: Resident Fellows, 404; Non-resident Fellows, 27; Foreign Associate Fellows, 20; Corresponding Fellows, 4; making, counting 4 whose dues have been remitted, a total of 504.

The monthly scientific meetings have grown in importance,

and during each year between thirty and forty communications are presented on the floor of the College. The average attendance has steadily increased, and as Fellows are permitted to invite physicians not members of the College, the audience is always an inspiring one.

Two years ago the College established a series of lectures on "Great Doctors and Achievements in Medical Research," to which not only all physicians are invited, but prominent citizens of the municipality. These lectures have served to educate the public and to demonstrate to the citizens of this community how important is the influence of this great institution. In 1910 the Weir Mitchell Lectures of the College of Physicians were created. Distinguished

MEDAL STRUCK ON THE DEDICATION OF THE NEW HALL OF THE COLLEGE OF PHYSICIANS. DESIGNED BY PROFESSOR R. MC KENZIE, OF PHILADELPHIA

lecturers, usually from a distant point, are invited, exactly as they are under the auspices of the Harvey Society of New York, and among these lecturers of the last year have been Arthur R. Cushny of London, Edmund Wilson of Columbia University, Svante Arrhenius of Stockholm, and William T. Porter of Harvard.

As constituted at present, the affairs of the College are administered by the following officers: President, vice-president, four censors, a secretary, treasurer, and honorary librarian. The Council of the College, composed of the officers named, the chairman of the eight standing committees, and six elective councillors, has supervision of the affairs of the College and executive capacity to act upon and dispose of any business referred to it by resolution of

the College, specifying power to act. The Council reports its decision upon all matters referred to it by the College for such opinion, and submits from time to time such suggestions as it shall believe to be adapted to promote the objects for which the College was instituted. It receives the monthly reports of the various standing and special committees and makes a monthly report at each stated meeting of the College. It passes upon the names of all those proposed for Fellowship. The standing committees are these: Publication, Library, Mütter Museum, Hall, Directory for Nurses, Finance, Entertainment, and Scientific Business.

In his inaugural address the first president of this College of Physicians prayed that wisdom, prudence, discretion, and judgment would be granted unto the Fellows to conduct their affairs to good effect and useful purposes, and prayed further that those who heard him and that those who were to follow in their footsteps would publicly and privately serve their generation. This we believe they have done, and we know that the College of Physicians has been a great good in this city, in this country, and in all that pertains to the advancement of medical science in all lands.

BIBLIOGRAPHY

Of the establishment and history of the College of Physicians of Philadelphia a number of notable accounts have been written and published, to wit: "An Account of the Institution of the College of Physicians of Philadelphia," by Dr. W. S. W. Ruschenberger, its president from 1879 until 1883 (*Transactions of the College of Physicians*, Third Series, vol. ix, 1887); "Reminiscences of the College of Physicians," by Dr. Alfred Stillé, its president from 1883 until 1884 (*Transactions of the College of Physicians*, Third Series, vol. ix, 1887); "A Commemoration Address on the Occasion of the Centennial Anniversary of the Institution of the College of Physicians of Philadelphia," by Dr. S. Weir Mitchell, its president from 1886 until 1889, and from 1892 until 1895 (*Transactions of the College of Physicians*, Third Series, vol. ix, 1887); "An Account of the Library of the College of Physicians of Philadelphia, 1788 to 1906," by Charles Perry Fisher, for a number of years its assistant librarian, and at present librarian and superintendent of the building (*Transactions of the College of Physicians*, Third Series, vol. xxviii, 1906); "Early Medical Libraries in America, Being an Account of the Origin and Growth of the Libraries of the Pennsylvania Hospital and of the College of Physicians of Philadelphia," by Dr. Francis R. Packard, a member of the Library Committee (*Medical Library and Historical Journal*, June, 1907); "The College of Physicians of Philadelphia," by Dr. J. Norman Henry, a member of the Hall Committee ("Founder's Week Memorial Volume," Philadelphia, 1908); "The College of Physicians of

Philadelphia," by Dr. W. W. Keen, its president from 1900 until 1902 (*British Medical Journal*, October 16, 1909); "Address on the Dedication of the New Hall of the College," by Dr. James Tyson, its president from 1907 until 1910 (*Transactions of the College of Physicians of Philadelphia*, Third Series, vol. xxxi, 1909); "Historical Sketch of the College of Physicians of Philadelphia," by Dr. Frederick P. Henry, its honorary librarian (*New York Medical Journal*, November 13, 1909); "Additional Facts and Observations relative to the Nature and Origin of the Pestilential Fever," Philadelphia, 1806; "Address from a Special Committee to the Medical Societies of the United States concerning the Dangers to which the Country is exposed by the Ineffectual Methods of Quarantine at its Ports," 1887; Centennial Celebration—"Catalogue of Loan Collection of Portraits," 1887; "Draught of the Pharmacopœia," prepared by Drs. Hewson, Wood, and Bache, as a Committee of the College of Physicians, 2 vols., 1831; "Medico-legal Report on the Schoeppe Murder Trial," 1869; "Report to the Board of Health on Epidemic Cholera," 1832; the articles mentioned in the first footnote. Necessarily it is from these sources that the material for this sketch has been derived, and from them, too, many statements have been quoted. This narrative also includes certain events of more recent occurrence and a few facts not previously published.

Progress of Medicine
During the year 1911

BY A. A. STEVENS, M.D.; EDWARD W. WATSON, M.D.;
AND LUCIUS W. JOHNSON, M.D.

PROGRESS advances with halting step. Not all years add an equal quota to the general fund of knowledge. 1911, while recording some advance, seems to have spent most of its energies in the improvement and perfecting of previous inventions and discoveries. The harvest of the year is not all the year's own growth. To produce an arsenical preparation as perfect as arsenobenzol demanded years of study and research before its public exploitation.

Inventive brains must sometimes have rest from inventing; new men born with the spirit of investigation must have time to grow up to the work; there lie about us many new worlds to discover, whose existence we now but dream of, and it may be many months and years before our hopes meet fruition and our dreams come true.

PROGRESS ALONG GENERAL LINES

One Kind of Progress, the Doom of the Practitioner.—It needs no prophet and no prophetic gaze into the future to see that the practitioner is rapidly merging into the salaried State official. There he will be a necessity, and as a necessity he will survive, for the masses, while for the affluent he will be an archaic luxury. When the readjustment comes, each man, or several men in association, will have districts assigned to them, limited in extent, which will conserve their forces, and the public will have a limited choice. This prospect may not at first seem agreeable. Men to fill these positions will have to be more "all-round men." For the necessary specialists the State will also have to provide, but the number of

special lines of practice will be much curtailed. The ophthalmologist will survive, and the surgeon, and perhaps the obstetrician, but many who practise the refined subdivisions of the medical calling of to-day will find their occupation gone. The public or the State, whichever has to pay, will no longer have to employ many men on a single case, as now, when competition and overcrowding have had much to do with the present state of things. These changed conditions will necessitate a much more complete education on the part of those who aim at State positions, and the number of students entering for a medical career will be less. It is also probable that the system now in operation in the United States Government services will soon prevail everywhere, and at stated intervals, probably every five years, these officials will have to undergo an examination, which will deter many from ever attempting the study of medicine, since a career liable to be periodically interrupted and which may be summarily brought to an end by failure to pass recurring examinations is not likely to prove enticing.

All this may not seem to show now, or in the future, progress in the profession, for such a reorganization may act as a drag on individual effort. The benumbing touch of bureaucracy may stifle research; politics may place in power, over better men, those who care not for these things.

Fee-Splitting.—Just at present we seem to see a glimmer of moral hygienic progress in the agitation in many quarters against what is called "fee-splitting," though this has not started from a purely moral standpoint, for the contest seems to be between those who regard it as a crime against the patient, a real robbery, and those who do not want to part with any portion of their gains. The revival, too, of efforts to stop the dispensary and hospital abuses marks progress towards honesty and fairness to all.

Sterilization as a Legal Procedure.—As an adjunct to the widespread agitation in regard to proof of physical fitness before marriage, we now have in several States laws for the restraint from procreation of habitual criminals, imbeciles, the insane, etc., by means of sterilization. The operation of vasectomy is the usual procedure in the sterilization of the male, and the somewhat more complicated one of oöphorectomy in the female. Segregation and other less radical

measures have been suggested for the prevention of the mating of those who would probably produce defective or undesirable offspring.

Dispensary Improvements.—The usefulness of the dispensary has been greatly increased by the practice, inaugurated in many parts of the country, of following up patients that are in need of continued treatment. In some cases a central station or registry bureau has been created through which it is possible to keep track of those who go from one dispensary to another. By this means also may be prevented, to a great extent, impositions by those who are able to pay.

The Nursing Profession.—It is now dawning upon both the physician and the public, as well as upon the nurses themselves, that the profession of nursing has reached such proportions as to make some sort of adequate State control an urgent necessity. There can be little doubt that the State Examining Board for Nurses is the correct legislative procedure, and it is to be hoped that uniform legislation in regard to nursing will be enacted in the various States.

The Retention of Dr. Wiley as Chief Chemist.—The failure of certain special interests to oust Dr. Wiley was, no doubt, due in great measure to the tremendous storm of protest that hurled itself against Washington from every part of the country. It is significant of what is yet to be accomplished in the way of securing pure food for the nation, that those who make their money by its adulterations are powerful enough nearly to cause the overthrow of their chief opponent.

A Clinical Congress of Surgeons.—Among the numerous meetings of medical societies and associations during 1911, one of the most important, and in a way rather unique, was the Clinical Congress of Surgeons of North America, which convened in Philadelphia, November 6th to 16th. The hospitals of the city were used as clinics, and an excellent opportunity was afforded for observation and study of the various methods of operative procedure in use by surgeons from all parts of the country.

Advances in Hygiene.—Life as a whole tends to grow longer in its average of years, yet the gain is almost all in infancy and childhood, for after 40 death comes sooner. To save infant life, State and city have reached out and assumed supervision and authority

over their little citizens, have tried to give them purer milk and water, supplied them in many places with visiting doctors and nurses, tried hard to teach ignorant mothers practical hygiene, looked into the quality of their food, and, where the milk and the water supply were of doubtful quality, impressed on them the value of heat as a sterilizing agency, and, as a reward, these new ideas have permeated the dense ignorance that once shielded the working classes from any attempt to give them aid.

This is an era of general medical publicity, not about drugs, but much the reverse, simply sound hygiene, the hygiene of cleanliness everywhere and every day, moral, mental, and physical, and progress in these lines bids fair to grow stronger as time goes on. There is a much smaller percentage of non-fatal sickness each year per thousand of the population than twenty, or even ten, years ago.

The schools, long neglected, yet all the time the centres from which many diseases were distributed, have at last attracted the medical and the civico-medical attention. The examination of the children was the first step, with visiting doctors and nurses in the schools. The physical as well as mental defects of the children are now noted, adenoids are removed, tonsillectomies done when required, eyes examined by experts and often glasses furnished if the pupils are unable to get them, their teeth put in order, and often sanitary lunches, and in some cases breakfasts, furnished at a nominal price, thereby avoiding the perils of the pretzel and apple stand around the corner, for it has dawned on the mind of the pedagogue, after many centuries, that the breakfastless child might seem brainless, too.

Ever before teaching should come the question, "Is the child fit to be taught?" We are rapidly coming to understand this, but yet are in the experimental stage, and somebody, some child, some teacher, is bound to suffer. It is also beginning to be recognized that exceptional ability in any line, in a child, should be noted and especially provided for, and in some States a move is being made in this direction, *viz.*, to give the exceptionally gifted child exceptional advantages in the line in which it shows talent, and furnish the real budding genius a better play for his preponderating gift. All this is part, and a very important part, of school hygiene.

Everything connected with our schools is of the first importance. When the schools close for holidays, longer or shorter, sickness falls off in greater or less proportion—but always falls off. Not only do well-ordered schools diminish sickness and death among their pupils, but in the homes of the pupils as well. In short, the schools make or mar the men and women who are to be when we are gone, and they should have every chance. Teaching should not be looked upon as primarily a means of livelihood nearly so much as a means of giving us a good, sound, well-educated coming generation on whom our whole future as a nation will depend.

MEDICINE

Acute Anterior Poliomyelitis.—Several important contributions to our knowledge of the epidemiology and treatment of acute anterior poliomyelitis have been made since Landsteiner and Popper and Flexner and Lewis demonstrated, in 1909, the infectious nature of the disease. Osgood and Lucas (*Jour. Amer. Med. Assoc.,* February 18, 1911) have shown that it is possible to reproduce typical poliomyelitis in monkeys by the inoculation of a filtrate of the nasopharyngeal mucus of infected monkeys several weeks, or even months, after the acute stage of the process has passed, and at a time when inoculation of the spinal cord from the same animals produced no symptoms of the disease. From this it is evident that the virus may remain active in the nasopharynx for a long time after the acute manifestations of the disease have subsided, and that efforts to control outbreaks of poliomyelitis must take into consideration the existence of carriers among persons who have recovered from the infection.

Taking advantage of the fact reported by a number of observers that the serum of persons who have recovered from an attack of poliomyelitis would neutralize the virus of the disease so that when injected into monkeys infection would not take place, Anderson and Frost (*Jour. Amer. Med. Assoc.,* Feb. 25, 1911) studied the serum from nine suspected abortive cases of poliomyelitis without paralysis and found that the serum of six of the nine possessed the same germicidal power against the virus as the serum from a frank case of the disease with extensive paralysis. They thus demon-

strated the possibility of recognizing abortive cases of poliomyelitis by the use of the biologic test, and at the same time furnished an explanation for the apparent immunity of children in households where there are typical cases with paralysis.

Since the recognition of the fact that formaldehyde can be detected in the cerebrospinal fluid after the administration of hexamethylenamine by the mouth, clinicians have been prescribing the latter in the treatment of poliomyelitis with asserted good results. Flexner and Clark (*Jour. Amer. Med. Assoc.*, Feb. 25, 1911) have found that if the drug be given so that it is present in the spinal fluid of the monkey and its administration be continued by the mouth, injection of the virus intracerebrally results, in some animals, but not in all, first in a prolongation of the period of incubation from six to eight days to twenty-four days; and, next, in the prevention of the paralysis. The authors emphasize the importance of these observations as showing that drug control of the virus in the body is a possibility, but that the successful results reported are in inhibiting an infection rather than in restraining one already established. We are fortunate to have in this issue an authoritative presentation of this subject by Dr. Flexner himself.

Mayer (*Deutsch. med. Woch.,* 1911, xxxvii, 1107) adds an important feature to the treatment of the paralysis resulting from poliomyelitis by describing MacKenzie's method of immobilization. Up to the present time the usual treatment after subsidence of the acute stage has been to apply massage and electricity to the paralyzed parts and eventually to place them in splints. While some patients have been benefited by this treatment, the majority have been uninfluenced by it and have subsequently exhibited pitiful contractures. The latter arise from the recovery of one set of muscles without the recovery of the opposing group, from long-continued crooked positions of the patient in bed, or from the pressure of the bedclothing. In the light of these relatively poor results the proposition of MacKenzie is highly interesting. He recommends, where paralysis occurs in the upper extremity, that the muscles, immediately on being affected, be placed at rest by splints and kept so for weeks or months; also, that the position be such as to relieve the muscle of any functional movement. By absolute rest in bed, the position and

angle of the splint are gradually changed. In ten patients coming under observation during the first ten days, MacKenzie reports nine as being cured by this method. In three of the cases a good result was apparent in from four to seven weeks up to eight months of treatment. Five cases treated with massage and electricity for over three months showed no sign of improvement. Mayer adopts this plan of treatment also in paralysis of the lower extremity, and uses a plaster-of-Paris mould instead of splints. The use of the plaster cast, it is claimed, tends to avert reflex irritation of the spinal cord and to prevent severe degrees of contracture and the formation of exudates. Of two cases cited by Mayer, one recovered entirely in four weeks, and another, with paralysis of the arms, legs, and back, recovered, except for a slight paralysis of the tibialis anticus, in two months. The patient should not be permitted to lie too long on the back, in order that by force of gravity the morbific poison of the disease may not induce softening of the cord, and thus give rise to future trophic disturbances.

Aviator's Disease.—As the bicycle brought us the bicycle face and the automobile the chauffeur's fracture, so the recent advances in aviation and the increase in the number of aviators have brought out its occupational disease, the "*Mal des Aviateurs,*" as described by Cruchet and Moulinier (*Jour. de Phys. et Path. Gen.,* 1911, xiii) and observed by them at the large French meets. Aeroplane flight calls for continuous attention and effort under conditions to which the organism is not primarily adjusted; the ascent to 9,000 feet is made in thirty to forty minutes and the descent to earth in five to seven minutes; the rapid change in barometric pressure and sudden alteration of twenty to thirty degrees in the temperature cause respiratory and circulatory irregularities and possibly partial loss of consciousness or autohypnotic states, to which many of the fatal accidents may be credited.

Beri-Beri.—The factors in the production of beri-beri seem to be climate, bad hygiene, and a diet composed largely of polished rice; in numerous cases reported from our tropical possessions a change of diet to rice not deprived of its cortex or the substitution of a legume for a part of the rice in the ration has resulted in an amelioration or a cessation of the disease.

Gangosa.—Active cases of this disease no longer exist in Guam, where it had been present for at least 150 years, and the discussion as to its identity is now settled. Odell (*Naval Med. Bull.,* Oct., 1911) reports that of forty-seven cases thirty-nine gave a positive Wassermann reaction, seven were doubtful, and one was negative. The patients were put on mixed treatment and improved so rapidly that there are now no cases with ulcers remaining. He regards it as an attenuated form of syphilis, some of the usual symptoms of which have been outgrown; children are carried to term and born well developed, without deformity or Hutchinson's teeth. No chancres are seen and there is no evidence that the disease is transmitted by sexual relations. The *Treponema pallidum* has not been demonstrated.

Sleeping Sickness.—Taute, in German East Africa, and Kinghorn, in Rhodesia, have demonstrated experimentally that *Trypanosoma gambiense* can be transmitted by *Glossina morsitans* as well as by *Glossina palpalis,* thus helping to explain the occurrence of sleeping sickness in regions where *Glossina palpalis* is not found. (*Lancet,* Dec. 30, 1911.)

Brill's Disease.—Considerable discussion has been caused by Brill's report (*Amer. Jour. Med. Sc.,* Aug., 1911) of a disease which, he states, differs from typhoid and typhus, though resembling each one in some of its characteristics. The identity of the condition is not yet established; but its latest evidence would seem to show that it is typhus in an abortive form.

Bothriocephalus Anæmia.—Investigations into the cause of bothriocephalus anæmia a few years ago led Faust and Tallqvist to the conclusion that this anæmia was caused by a hæmolytic lipoid contained in the proglottides of the tapeworm. In pernicious anæmia, again, a lipoid substance could be demonstrated in the stomach and bowel. The authors have now succeeded in showing that this lipoid substance is oleic acid, and expressd the belief that pernicious anæmia might be treated by rendering the oleic acid innocuous. Glycerine seemed to be especially suitable for the purpose, as it forms, with oleic acid, triolein, which is harmless. Adopting this suggestion, Vetlesen (*Norsk Mag. f. Lagevidenskaben,* 1909, No. 10) administered the drug in doses of half an ounce, three

times a day, in a severe case of pernicious anæmia with very good results. It may be, as Mann and others have suggested, that some of the good effects attributed to bone marrow may in reality have been due to the glycerine used in extracting and preserving the marrow. A recent communication by Effendi (*Deutsch. med. Woch.*, 1911, xxxvii, No. 20) confirms the value of glycerine. After a month's treatment the patient's red cells rose from 970,000 to 4,200,000, and the hæmoglobin from 20 per cent. to nearly 100 per cent. The only by-effect, even when the dose of glycerine was increased to 70 grammes, thrice daily, was a transient diarrhœa.

Cholera.—Some have expressed the hope that the war between Turkey and Italy may result in a policing of the recurring pilgrimages to Mecca and Medina and that the holy well in the former place may at last be disinfected and this source of the recurring epidemics purified, but this is an illusive hope. Our great safeguard must be in quarantine and supervision of the flood of immigration, and, while this seemed a few years ago a simple thing, it has become much more difficult and doubtful since we awoke to the perils of "carriers." This puts upon both health officials and immigrants much more care and delay, and much more tedious and troublesome methods of examination. Immigrants leaving the port of arrival must still be kept in touch with, till the now extended period of danger is over.

The recent outbreak of cholera in Palermo has afforded Rogers the opportunity of testing, under European conditions, the system of treating cholera which proved so very successful in his hands in Calcutta. The treatment, which is fully described in the *British Medical Journal* of September 24, 1911, consists in the injection—intravenous or subcutaneous—of hypertonic saline solution, and the administration of permanganates by the mouth. By the use of the hypertonic solution alone he obtained a remarkable reduction in the mortality in Calcutta. Among native patients the fall was from 60 to 33 per cent. When injections were supplemented by the administration of permanganates by the mouth, the mortality was lowered to 23 per cent. In Calcutta the disease was much more severe in Europeans and the results were not so good; it was therefore deemed very desirable to test the method in cases of cholera

occurring in Europe. During three weeks in Palermo, Rogers had the opportunity of treating nearly seventy very severe cases in the algid stage. The rate of recovery was between 60 and 70 per cent., a result better than he had obtained in Europeans in Calcutta. The solution recommended is composed of sodium chloride, 120 grains; potassium chloride, 6 grains; calcium chloride, 4 grains; water, 1 pint. As a rule, the solution should be given intravenously, although, should the blood-pressure be fairly high, above 180 Mm., it may be given subcutaneously. If the blood is highly concentrated, as shown by a specific gravity of 1063 (normal 1056), the injections should be intravenous. The quantity usually required is about four pints, but if the specific gravity of the blood is very high, as much as six pints may be necessary; in which case the last two pints should be injected very slowly. The permanganate should be given by the mouth from the first. The simplest plan appears to be to make a solution of calcium permanganate (which is less astringent than the potassium salt) of the strength of two to six grains to the pint, and to allow the patient to drink this *ad libitum*. In addition, potassium permanganate should be given in keratin-coated pills, containing two grains each. The pill is given every fifteen minutes and then every thirty minutes until the stools become small and green, which usually occurs in about twelve hours.

Cancer.—According to Sir Henry Butlin, cancer is not caused by a specific parasite. The cancer cell (unicellula cancri) is formed within the body and itself acts as a parasite in the formation of lesions characteristic of the disease.

As a result of the work done by Pawlow and Starling in investigation of the nature and action of hormones, a theory has been put forth that such substances may excite the specific activities of certain cells and be concerned in the production of cancer, thus explaining the quantitative and qualitative differences in the growth of cells of malignant tumors. Levine and Sittenfield (*Jour. Med. Research,* Sept., 1911) discuss these theories and conclude that their value for interpretation of the phenomena of growth of tumor cells can be only very indirect and general.

Cardiac Diseases and Functional Derangements of the Heart and Blood-Vessels.—Cardiac diseases, apparently increasing rapidly

and probably due to the increased complexity and strain of recent years, are being studied as never before. Each age has its peculiar conditions producing peculiar results. The outbreaks of epidemic nervous diseases that characterized the middle ages found their causes in the state of society and the morbid religion of the period. We suffer, but from different causes. There is a great field with uncertain boundaries to be explored in the influence of the brain and nerves on the arteries and heart, which we now recognize but explain in terms all too vague and general.

Arterial Hypertension.—High arterial tension, its causes, effects, and methods of treatment, have received the attention of many investigators; its greater frequency in the city dweller calls attention to the contrast between conditions of life in the cities and that in the country; the greater mental activity and worry, the richer diet, with its variety of pressor agents, the loss of sleep and the rapidity of travel, all are factors in the production of continued high pressure, and are becoming more wide-spread and more important as such. Hypertension is rarely produced by arteriosclerosis alone; usually a kidney lesion is present, and, with a pressure of over 200 Mm., practically always. We are learning to look on high pressure in a man of 60 or over not as a disease but as a condition necessary for him if he is to maintain his headway, and we cannot reduce it below a certain level without doing him harm.

Disturbances of Cardiac Function.—Whether the myogenic theory of cardiac action be accepted or not, it must be admitted that studies conducted in line with this theory have led to a much better understanding of the heart's function and have thrown open the whole field of cardiac therapeutics to accurate scientific investigation. The cardiac muscle apparently possesses the following functions: the power to excite contraction (stimulus production); the power to receive a stimulus (excitability); the power to transmit a stimulus from one part to another (conductivity); the power to contract in response to a stimulus (contractility); and the power to remain contracted to a certain degree when active stimulation has ceased (tonicity). Abnormalities of rhythm in relation to the several functions are well shown in the following table arranged by M. Schulman (*Jour. Amer. Med. Assoc.,* Oct. 7, 1911):

Normal cardiac function.	Resulting abnormality when corresponding function is disturbed.	
1. Stimulus production	Sinus irregularity; youthful irregularity.	
2. Excitability	Extrasystole	Auricular. Ventricular. Auriculoventricular.
3. Conductivity	Heart-block, partial or complete	Sino-auricular. Interventricular. Auriculoventricular.
4. Contractility	Pulsus alternans.	
5. Tonicity	Absolute irregularity or auricular fibrillation.	

Sinus irregularity is the result of a reflex acting through the vagus nerve, its inhibitions coming to the sino-auricular node at varying rates. The cause of the trouble is usually outside of the heart. It occurs most frequently in young persons, in neurotic individuals, or after infectious diseases. It rarely causes any subjective symptoms. Large doses of atropine (1/60 grain) will ordinarily cause a complete or partial disappearance of the irregularity, with a simultaneous increase of the heart-rate, but the effect is generally temporary. Sinus irregularity has little significance and offers a good prognosis. If any treatment is instituted it should consist in reassurance, good hygiene, and tonics. Digitalis is likely to aggravate the condition (Cushing, *Amer. Jour. Med. Sci.,* 1911, cxli).

Extrasystoles are interpolated, premature contractions originating in parts of the heart muscle other than those normally governing the rate. They seem to be due to heightened irritability of the heart, the result, as a rule, of disease of the myocardium. They occur in hearts which are the seat of rheumatic lesions and cardiosclerosis. Dyspepsia, constipation, the abuse of tobacco, overindulgence in tea and coffee, and all functional disturbances that raise the irritability of the entire nervous system often cause the appearance of extrasystoles, and the removal of such exciting factors may terminate the attack. Subjective symptoms are often absent, but not rarely there is complaint of palpitation, especially in the younger patients. In many cases treatment is not satisfactory. Exciting factors should be suppressed and the patient's general condition improved. Wenkebach holds that small doses of digitalis lessen cardiac irritability, but it is well established that large doses are capable of causing extrasystoles and of superadding functional heart-block. According

to Schulman, bromides and potassium iodide, the former in 20-grain doses, thrice daily; the latter in 5- to 10-grain doses, thrice daily, are the most commonly useful drugs.

Heart-block results from an interruption of the stimuli beginning at the sinoauricular node in their progress to the rest of the heart. It is partial or complete according as some or all the stimuli are interrupted. By far the commonest and most important form of heart-block is auriculoventricular, or one in which the obstruction is in the conducting bundle of His, between the auricle and ventricle. Functional block depends upon overstimulation of the vagus and is most frequently seen in consequence of the too free use of digitalis. Organic block is due to organic disease, generally sclerosis, but rarely a gumma, of the auriculoventricular bundle. The only evidence of partial heart-block may be lengthening of the *a—c* period, or the time between the auricular contraction and the onset of the ventricular contraction, as shown in the venous pulse tracing; but when the block is well advanced, it is shown by the occurrence of only one ventricular systole for every two, three, four, or even more auricular systoles. In complete block the ventricle assumes an independent rhythm, which is usually thirty per minute, or less. In mild forms of block the only subjective disturbances are those dependent on insufficient peripheral circulation. In the well-developed form there may be vertiginous, syncopal, or epileptiform seizures (Adams-Stokes' syndrome). The course is variable; in some cases death occurs within a few weeks, but in others life is spared for many years, even though the cerebral attacks continue. Occasionally the condition is transitory. The activity of the patient should be made commensurate with reduced cardiac output. Digitalis is contraindicated. Atropine is of service in certain functional cases. When syphilis is suspected, vigorous anti-luetic treatment should be instituted.

Pulsus alternans constitutes irregularity of force with a maintenance, when uncomplicated, of a normal rhythm. It is found in middle-aged and elderly persons, generally with high blood-pressure, and is commonly dependent upon old cardiac rheumatism with valvular defects, especially mitral stenosis, or cardiosclerosis. Subjectively it gives rise to dyspnœa, palpitation, precordial distress, or

even angina pectoris. It does not of itself cause œdema, cyanosis, or irregularity of rhythm. The prognosis must be guarded. In its treatment rest, mental and physical, is essential. Digestion should be kept in good condition. Nitrites are sometimes serviceable when the blood-pressure is high. Potassium iodide is occasionally useful. Digitalis is to be avoided.

Auricular Fibrillation.—One of the most important clinical conditions which the systemic use of graphic records of the heart's action has brought to light is auricular fibrillation (absolute irregularity, nodal rhythm). According to J. MacKenzie (*Brit. Med. Jour.,* Oct. 14, 1911), from 60 to 70 per cent. of all cases of serious heart-failure met with in practice are caused directly by auricular fibrillation, or are aggravated by it. In this condition, though the muscle of the auricle is the seat of rapid minute twitchings, the wall of the chamber as a whole is stationary in the diastolic position. Organic change in the muscle, usually rheumatic or senile, is the underlying causal condition. The exciting factor is often undue physical effort, but the inception of the new rhythm is sometimes noted when there has been no excessive effort. The diagnostic features are irregularity of the pulse of a very disorderly kind, and absence of a normal auricular wave in a tracing of the jugular vein. In cases of mitral stenosis a presystolic murmur disappears, whereas, if a diastolic murmur has been present it persists. The rate of the pulse varies; generally it is increased. The heart usually shows considerable enlargement. Signs of heart-failure, ranging from breathlessness on exertion to intense dyspnœa without enlargement of the liver and dropsy, are generally present, but are not peculiar to or characteristic of the condition. Occasionally the heart is only slightly embarrassed in its work. Precordial distress and pain are not uncommon, but definite attacks of angina pectoris are rare; indeed, according to MacKenzie (*Brit. Med. Jour.,* Oct. 21, 1911), when the patient has had bad angina the attacks frequently cease with the onset of fibrillation. In some cases this type of disturbance is transient, but in the majority of cases it persists for the remainder of the patient's life. The prognosis depends very largely upon the extent and duration of the changes in the heart muscle that have led to the fibrillation. Very often the signs of heart-failure are so pronounced that the gravity

of the condition cannot be overlooked. In the absence of definite signs the manner in which the individual responds to effort will indicate how far the heart muscle is able to overcome the embarrassment induced by the irregular action. Occasionally fibrillation persists for years without causing serious disturbance.

Treatment need not be given unless there is evidence of heart exhaustion. When there is such evidence the possibility of diminishing the amount of daily effort is the first consideration. Among drugs digitalis is the sovereign remedy. Once cardiac failure from auricular fibrillation is diagnosed, no matter what the size of the heart, no matter what valve lesion is present or not present, digitalis is indicated (Schulman). The reason that this drug has acquired such a reputation is, according to MacKenzie, because of the peculiar susceptibility of patients with auricular fibrillation; practically all recorded cases illustrating the remarkable effects of the drug are cases of auricular fibrillation. From one to two drachms of a good tincture should be given in divided doses daily, according to the urgency of the symptoms, until the pulse has been reduced to seventy beats per minute. When this is accomplished the drug should be stopped for a few days, and resumed in small doses when the rate begins to increase. The rate of the pulse should be watched and an effort be made to find the dose which will maintain the improved condition without producing any unpleasant symptoms.

Treatment.—Analyzing the results obtained in thirty-six cases of valvular disease or cardiosclerosis, F. W. Price (*Brit. Med. Jour.*, Oct. 21, 1911), associate of MacKenzie at the Mt. Vernon Hospital, elicited the following facts: there was marked improvement in all cases (thirteen) of auricular fibrillation excepting two—one with fever, and another case of senile cardiosclerosis. Of the cases of valvular disease without fibrillation, in only two cases was there marked improvement. The best results were in cases with a rheumatic history. In no case in which digitalis failed to act favorably did any of the other drugs succeed. Strophanthus showed greater variation with regard to dosage, especially in producing diarrhœa, but, as a rule, much larger doses of digitalis were required. Squills had little effect. Concerning the use of strychnine, MacKenzie (*Brit, Med, Jour.*, April 15, 1911) states that he has

sought in vain for the slightest evidence of the effect of medicinal doses of the drug upon the heart. In two cases of tachycardia, arising from an abnormal source, studied by MacKenzie (*Heart,* August, 1911), digitalis caused the heart to revert to a normal rhythm, first inducing fibrillation of the auricle.

Much difference of opinion prevails concerning the relative efficiency of the various preparations of digitalis. Perhaps a well-made tincture freshly prepared from good leaves is as reliable as any other. Digipuratum is well spoken of by a number of authorities. It is an extract derived from digitalis leaves with the elimination of digitonin, one of the most irritant glucosides of digitalis. The extract is a yellow liquid, which for greater convenience is diluted with sugar of milk and made up into tablet form, each tablet containing one gramme of the powder, corresponding to the average strength of 0.1 gramme of the powdered leaves. Digipuratum, according to Boos, Newburgh, and Marx (*Archives of Internal Medicine,* April, 1911), has now been in use at the Massachusetts General Hospital for over a year in the treatment of more than 180 cases of heart disease. The effect on the urinary output was very prompt in most instances. There was not a single instance of vomiting or diarrhœa, and cumulative action was never observed. Digipuratum is also very favorably commented on by Herz (*Wien. med. Woch.,* 1911, Nos. 12 and 13). MacKenzie has found Nativelli's digitalin granules very efficacious, and considers that one granule (1/4 milligramme) is equal to fifteen minims of the tincture.

Diabetes.—The older view that the hyperglycæmia of diabetes results from an overproduction of sugar in the liver rather than from diminished oxidation in the tissues is supported by a considerable body of evidence. The liver has long been recognized to be the regulator of the sugar content of the blood, but the pancreas and the suprarenals are now also known to be concerned in the process. The internal secretion of the pancreas appears to lessen and that of the suprarenals to increase the activity of the liver in the production of sugar. The internal secretion of the thyroid modifies the action of the pancreas, and therefore in exophthalmic goitre there is a tendency to glycosuria, while, on the other hand, after thyroidectomy and in myxœdema glycosuria is difficult to produce.

Notwithstanding this multiplicity of factors concerned in the production of glycosuria, it is generally admitted that anomalies of the pancreas play a leading part in by far the greater number of cases of diabetes, whether slight or severe. Accepting the view that diabetes depends on an excessive output of sugar, von Noorden (*Wien. med. Klin.,* 1911, No. 1) holds that the chief indication in treatment is to avoid anything which excites the liver to overproduction. In severe cases muscular activity which calls for an additional supply of sugar for the muscles causes an increase in the glycosuria. Food of any kind excites the liver to activity, and few cases of glycosuria will fail to be modified temporarily by absence of food for a couple of days. Carbohydrates have the greatest effect in causing overproduction, fats the least. In severe cases proteids are powerful irritants, and on this account the unlimited amount of meat which used to be allowed has latterly been restricted. Individualized treatment is especially needful.

Of the many special types of treatment for diabetes in recent years none has attracted so much attention as the oatmeal "cure" introduced by von Noorden. Essentially this consists in feeding, at frequent intervals, a daily amount of 250 grammes of oatmeal, 100 grammes of protein, preferably of a vegetable character, and 300 grammes of butter, prepared in the form of a soup or porridge, along with an occasional allowance of black coffee or cognac. It is noteworthy that von Noorden himself has pointed out that oatmeal feeding is without influence in many cases, and may even be detrimental in some instances. Among 310 patients, von Noorden found that 65 were not benefited and in 35 the symptoms were aggravated (Lampe). The treatment is more particularly indicated in the severer forms of diabetes with acidosis. Various attempts have been made to explain the action of the oatmeal diet which, with certain reservations, has received the endorsement of many competent observers. Magnus-Levy (*Berlin klin. Woch.,* 1911, xlviii, No. 27) believes that the beneficial effects are to be explained mostly by the absence of meat from the diet, but at the same time he admits that oatmeal starch may have certain special features different from those of other cereals. Minkowski (*Med. Klinik.,* 1911, vii, No. 27), who has derived unmistakable benefit from the oatmeal diet in certain

cases, is also of the opinion that much of the good is to be attributed to the restriction of the protein intake. Blum (*Münch. med. Woch.*, 1911, lviii, 1433) has treated 35 cases of diabetes with wheat flour in place of oatmeal in the von Noorden diet and claims that the results have been equal, if not superior, to those obtained with oatmeal. Consequently, he thinks that the green-vegetable days, which should always follow the oatmeal days in severe cases, serve to relieve the blood of the excess of sugar, and following this period of relative starvation the individual's tolerance for starches increases.

Gastric Dilatation.—Acute dilatation of the stomach is an affection the importance of which is just beginning to be appreciated. It is the result of atony or paresis of the gastric muscles, the primary cause of which is usually an abdominal operation or injury, or some acute infection, notably pneumonia or typhoid fever. Of 140 cases compiled from the literature by Hellendall (*Monats. f. Geburt u. Gynäk.*, 1911, No. 1), in 86 the dilatation followed an operation. In 39 the operation was gynæcological, and in 12 it was for gallstones. Payer (*Mitt. aus den Grenz. d. Med. u. Chir.*, 1911, xxii, No. 3) is convinced that in these postoperative cases the trouble is in reality a primary paralysis of the stomach from the toxic action of the anæsthetic. In every case in which postoperative vomiting persisted for more than twelve to twenty-four hours he found that atony of the stomach was also present.

The diagnostic features of acute dilatation are severe epigastric distress, abdominal distention, explosive vomiting of large quantities of bilious fluid, splashing sounds on quick percussion, great thirst, and progressive collapse. The actual cause of these symptoms is very often overlooked, the presence of intestinal obstruction or peritonitis being assumed. This was the diagnosis in seven of eleven cases recently reported by Hanssen (*Nordisk. Med. Arkiv.*, 1911, xliii, No. 2) of Christiania. Unless treatment is instituted soon death generally occurs within a few hours or days. Conner (*Amer. Jour. Med. Sci.*, 1907) gives a death-rate of 72.5 per cent. in 102 cases, and Laffer (*Annals of Surgery,* April, 1908), one of 62.5 per cent. in 217 cases. Frequent lavage, the knee-elbow posture, saline enemas, and appropriate stimulation are the measures most likely to afford relief. All food and drink by the mouth must be interdicted. Strych-

nine and eserine hypodermically seemed of value in two of five cases in pneumonia, recently reported by Fussel (*Amer. Jour. Med. Sci.*, Dec., 1911). Kehr and Tschudy, among others, have been successful with gastro-enterostomy, but most writers warn against operative interference. An early diagnosis and prompt measures for relief will generally forestall the necessity for an operation.

Hæmoptysis.—The management of hæmoptysis is at present in such a chaotic state that any contributions to the subject from reliable sources are always welcome. J. Walsh (*Penna. Med. Jour.*, May, 1911) considers epsom salts one of the most important remedies. The basis for its usefulness is that, in addition to its irritant action, it dilates the intestinal vessels and removes a certain amount of liquid from the circulation, thereby thickening the blood. Half an ounce may be given at once and repeated in two hours, especially if the bleeding continues. Without denying the efficiency of this drug early in the course of pulmonary hemorrhage, it is conceivable that it might prove dangerous when the hemorrhage has continued until the heart is rapid and the respiration has become accelerated and forcible from anæmia of the cerebral centres.

Nitrites have been favored because of their vasodilator action, but it has been shown that they cause a general increase in pressure throughout the pulmonary circuit by augmenting the rate and amplitude of the heart's contractions. Digitalis has been suggested, but J. Wiggers (*Archiv. of Int. Med.*, July, 1911) has found that alcohol-free preparations of the drug actually increase pulmonary bleeding by increasing the output of the right ventricle and constricting the pulmonary vessels. This writer points out that the chief object of treatment when there is evident anæmia of the brain is to elevate the systemic arterial pressure and simultaneously to lower that in the pulmonary circuit, and he says that of all drugs investigated the only one that possesses this fortunate combination of action is pituitary extract.

Influenzal Meningitis.—That influenzal meningitis is by no means a rare affection is being shown by the increasing number of reports of its occurrence. Within a few months, in the United States alone, reports dealing with the subject have been published by Wollstein, Dunn, and Davis. Moreover, the disease is highly fatal.

All but 6 of the 58 cases thus far reported in which the influenza bacillus has been detected in the cerebrospinal fluid have terminated fatally. The meningitis may follow infection of the respiratory tract or it may develop independently of any obvious disease of that tract. Wollstein (*Jour. of Exp. Med.*, July, 1911) has demonstrated that the injection of cultures of *B. influenzæ* into the subdural space of monkeys is followed by the development of acute meningitis similar, in all respects, to influenzal meningitis in human beings. And further, he has found that by repeated injection, over a period of many months, of living cultures of *B. influenzæ* into the monkey, an immune serum, possessing moderate agglutinating and high opsonic power, may be produced, which is capable, when injected into the subdural space, of arresting the progress of experimental influenzal meningitis, and of bringing about recovery in monkeys thus affected. In view of the highly fatal character of influenzal meningitis in human beings, the employment of an immune serum by subdural injection is to be recommended. Undoubtedly it will be necessary to employ the serum early and repeatedly to secure beneficial results. The early application will, in turn, be dependent on prompt bacteriologic diagnosis, which can be made, as a rule, by immediate microscopic examination of the cerebrospinal fluid without the employment of cultural methods.

Malta Fever.—The so-called "goat fever," which has been known to be endemic in the Southwest for at least twenty-five years in those associated with goat raising, has been identified by Gentry and Ferenbaugh as Malta fever; the *Micrococcus melitensis* has been isolated, and agglutination tests have been positive both in goats and men. Many of the goats are direct descendants of imports from Asia Minor and South Africa, where the disease exists.

Pellagra.—The fight over the cause of pellagra is really a fight for the protection of the value of our millions of bushels of corn. It is the fight of Kansas, Nebraska, and other corn-belt States, and of every farmer who raises a few bushels, against Italy and the congeries of small Eastern States that absorb our surplus product, to save our home consumption from the blight of suspicion. A blow was struck back at us when it was advanced as a theory that cottonseed oil was the cause of pellagra, for is not cotton-seed oil exported

and brought back as the pure product of the olive trees of Lucca? Sambon's theory of transmission by sand-fleas has received considerable attention but has few supporters in the United States. Carletti has found (*Gazetta degli Osped. e delle Clin.*, Milan, June 8, 1911) a negative Wassermann reaction in 100 per cent. of cases; this he considers an argument against the protozoan theory; Sambon speaks strongly of the close analogy between pellagra and certain protozoal diseases. Carletti also points out that no case is known in which a healthy person sojourning temporarily in a sand-fly infested or pellagra infested region has contracted pellagra from brief exposure to the fly, while this is of frequent occurrence with malaria. Alessandrini's theory that pellagra is due to a water-borne nematode of the Filariidæ has not been confirmed by other investigators. Salvarsan has been used with some degree of success; King and Crowell have reported (*Jour. Amer. Med. Assoc.*, Nov. 18, 1911) that eighteen out of nineteen cases treated with this agent have apparently recovered, and Nice (*Tex. State Jour. Med.*, Nov., 1911) has reported three cases which showed immediate and rapid improvement after its use. Transfusion has been tried to a limited extent, and Bennett and Scott (*Tex. State Jour. Med.*, Sept., 1911) have reported cures in thirteen out of sixteen cases treated by transfusion of blood from a healthy donor. The disease still spreads by discovery of new cases, and has now been reported as present in upwards of forty States. South Carolina is reported to have 50,000 cases, and we are told that there are at least 300 cases in Philadelphia.

Plague has been traced back to the marmots in a certain part of the Russian domain, where the disease seems to be endemic with occasional outbreaks, which would undoubtedly be more frequent were the afflicted region not isolated by the interminable "steppes" in every direction, which limit travel. How soon the disease may break out somewhere in the United States is a question of serious moment when we consider that in many Western States the squirrels and prairie-dogs (the species we have most like the marmots of Siberia) are in many instances found to be infected with the plague bacillus.

Cases have been discovered in immigrants at our ports of entry, and early in the year human plague was present in every continent.

The present epidemic in North China is the first of recent date in which the pneumonic form exists to the almost complete exclusion of the bubonic form. The flea of the rat is no longer considered as the medium alone of the spread of the disease; it has been introduced into each new centre by the arrival of persons actually suffering with the plague or incubating the disease: the sputum has been found to be infectious as long as it remains moist or frozen, and the pneumonic form is admittedly contagious from man to man. Cantlie (*Jour. Trop. Med.*, Feb. 15, 1911) calls attention to the numerous cases of "tropical bubo" in India and China previous to the outbreak of the great epidemic of 1893, and suggests that this is due to infection by a special form of *Bacillus pestis* of slight virulence.

Tuberculosis as a Predisposing Factor in Pleurisy.—In the last decade a number of observers have called attention to the frequency with which so-called idiopathic pleurisy is followed by tuberculosis. While the immediate prognosis of pleurisy is usually good, the remote prospect is always a cause for anxiety. V. Y. Bowditch found that of 90 patients treated for pleurisy by the elder Bowditch 30 had died of tuberculosis. Barrs reported 57 cases treated at Leeds; of this number tuberculosis developed in 21. Salanove-Ipin, of the French navy, ascertained that of 301 patients with pleurisy 84 afterwards became tuberculous. Hamman got reports from 88 patients treated at the Johns Hopkins Hospital, and of these 30 later became tuberculous.

In the last year the matter has again been investigated by Allard and Köster (*Hygiea,* Oct., 1911). These observers base their conclusion on 514 cases of pleurisy with effusion and 2,123 cases of tuberculosis. The data, tabulated from various standpoints, confirm the assumption that in at least half the cases of pleurisy tuberculosis may be counted on to follow within five years, but in this respect the young are much better situated. Breckman and Tint (*Jour. of Med. Research,* June, 1911) believe that a low opsonic index to streptococci and pneumococci in primary pleurisy may prove an aid to the diagnosis of a susceptibility to tuberculosis.

Tuberculous Peritonitis.—Tuberculous peritonitis was one of

the subjects chosen for discussion by the Section of Diseases of Children at the last annual meeting of the British Medical Association. Rolleston (*Brit. Med. Jour.,* Sept. 2, 1911), in his able opening address, called attention to the conditions liable to occasion mistakes in diagnosis. When the disease begins acutely, which it does in about one-third of the cases, it very strongly suggests appendicitis, typhoid fever, or pneumococcic peritonitis. When it begins insidiously, it may readily be mistaken for hepatic cirrhosis. In ninety cases of hepatic cirrhosis collected by Woolley, ascites was present in 59 and in 12 tuberculous peritonitis was diagnosed. The resemblance between the two affections may be close; in both malnutrition, splenomegaly, ascites, and some elevation of temperature may occur. Further, the thickened omentum may be mistaken for enlargement of the liver. In doubtful cases, distention of the subcutaneous abdominal veins, a negative tuberculin test, a preponderance of endothelial cells, as against lymphocytes, in the ascitic fluid, and a negative result from the injection of the latter into guinea-pigs are in favor of cirrhosis.

Regarding treatment, there was an agreement among the speakers as to the value of rest to the intestines through the agency of bandaging, accompanied or not by inunctions of mercury, iodoform, or iodine. A similar agreement also prevailed as to the cases most suitable for operation. That this is imperative when intestinal obstruction is present or simulated is not to be questioned; and this is also true of the cases in which an abscess is pointing near the umbilicus. On the other hand, it is generally agreed that operation is contraindicated in generalized or wide-spread tuberculosis, and therefore in infants under 12 months of age and in patients with signs of pulmonary tuberculosis; and that it is unnecessary in the fibrous and adhesive forms in the absence of any urgent symptoms of intestinal obstruction.

The only other cases commonly submitted to operation at the present time are the ascitic ones. In these some difference of opinion obtains as to the value of the procedure. The consensus of opinion, however, appears to be that in all such cases laparotomy is a valuable aid to recovery. In 125 cases treated by operation there were 88 cures, or 70.4 per cent., whereas in 156 cases not operated on

there were only 51 cures, or 33 per cent. (Rolleston). The question of operation on ascitic cases may be fairly summed up in the statement that it should be tried after hygienic and medical treatment has been given a fair trial for a month or so without any definite benefit.

Lumbar Puncture.—A recent medical writer, in discussing the diagnosis of anterior poliomyelitis, says that there are thirty well-known disease conditions with which, in its onset, it can be readily confounded, the only way to discriminate being by the results of lumbar puncture. This amounts to advising it in about all cases of children's diseases, and the natural query is, is the procedure entirely a safe one in all hands? Spinal puncture is as yet in its infancy; when it becomes a routine procedure in diagnosis and is performed alike by the expert and the inexpert, the few fatalities that have already been reported will be increased by many more. As a diagnostic aid in some diseases of the meningitis type its use may be defended. One physician reports that he has long used it as a routine performance and has thus stumbled unexpectedly on many cases of syphilis. To use it as a dragnet, as a detective in the doctor's gropings after disease, seems going too far. In hospitals lumbar puncture is a simple matter, but in private practice its advisability depends on the surrounding conditions and the technical knowledge of the physician; it should usually be done if meningeal symptoms are present.

Induced Pneumothorax in Tuberculosis.—The method of treating pulmonary tuberculosis by inducing an artificial pneumothorax is not new. It was first tried by Carson about 1840 (Rhodes, *Brit. Med. Jour.,* Oct. 28, 1911). Recently Forlanini, Späth, and Murphy have improved the technique of the operation, and reported many successful operations. Now Brauer of Marburg, Spengler of Davos, and Saugman of Norway, have carried out the treatment extensively, and, on the whole, very successfully. Nitrogen is the gas usually selected for inflating the pleura, and the method of introducing it into the sac is described in detail by Rhodes.

In their most recent book on the subject ("Rhinesche Beobachtungen bei künstlichen Pneumothorax") Brauer and Spengler give the results in some 87 patients treated by this method. They

mention 26 more in which it was found impossible to produce the pneumothorax. In 17 patients the disease was apparently arrested, in 39 the lung condition was much improved, making the ultimate prognosis favorable; in 14 the lung condition was improved, but for some reason, such as abdominal tuberculosis or fresh infection, the final result was not good, and in 17 there was no good result. Of the whole number, 21 patients are now dead. These results were obtained in patients who were seriously ill and becoming worse.

The indications for this treatment, according to Rhodes, are: (1) pulmonary tuberculosis limited almost, if not entirely, to one lung; (2) recurrent hæmoptysis if at all severe, (3) continued fever, cough, and general increase of disease on one side, while the other lung is healing or only slightly affected.

Cahn (*Therap. Monatshefte,* Oct., 1911) has found that in one-third of the cases of unilateral disease the production of pneumothorax yields good and lasting results, that in a smaller fraction a certain benefit is achieved, and that in about one-fifth, through unavoidable pleurisy, especially empyema, the result is vitiated. Wellmann (*Beiträge z. Klin. der Tuberk.,* Dec. 10, 1910) summarizes the experience with this measure in 27 cases at the clinic of Matthes at Cologne. He commends the measure for wider adoption and thinks it is likely to prove serviceable, but that final judgment can be made only on the basis of more extensive and longer experience.

X-rays in Tuberculosis.—The diagnosis of tuberculosis by the X-ray has been carefully studied, and it now has, in the hands of the experts, a settled and definite value in the recognition of the early pulmonary lesions, particularly when stereoscopic plates are used.

X-rays in Leukæmia.—It is generally admitted that no remedy accomplishes so much good in leukæmia as the X-ray. To be successful the ray should be applied to the spleen and long bones, the exposures lasting from five to fifteen minutes, and being repeated twice or thrice a week. The good effects are thought to be due to the destruction of the leucocytic and leucoblastic tissues. It is interesting to note, however, that in some conditions the ray has an opposite effect; that is, it may induce an affection of the blood and blood-producing organs. Sternberg (*Deutsch. med. Woch.,* 1911,

xxxvii, No. 12), for instance, refers to four physicians who had worked considerably with the X-ray and who have died from leukæmia or pseudoleukæmia. All the cases date from the days when Röntgenologists were less careful about protecting themselves than at present.

THERAPEUTICS

Sensible therapeutics is having a revival; even polypharmacy, to a certain extent, has developed defenders who try to show that there is a fallacy in the remark so often made that single remedies should alone be administered for real results. Drugs are often modified and increased in usefulness by combination. Nobody doubts that the usual hypodermic tablet of morphine and atropine is often better for use than morphine alone. Scopolamine and morphine and strychnine assist each other, and the same is true of many other remedies. Anæsthetics in combination, or one used to reinforce or prolong the sleep produced by the other, are in high favor with many operators.

Much uncertainty exists as to the actual value of our armamentarium for the treatment of cardiac disease, as well as to the propriety and the limits of the usefulness of massage, exercises, the Nauheim methods, and all the vaunted methods and procedures and remedies in vogue in recent years. *Digitalis,* once given in tincture, infusion, and powder, has been resolved into its component active elements, and around them the clever pharmaceutical chemist has woven a tissue of subtle distinction, exploitation, and suspicion. Many believe that the only way out is to return to the herb itself till we are on more certain grounds, for as we gain by animal experiment more knowledge of the actual effect of each drug and active principle so are we confronted with our yet existing want of definite knowledge of the conditions we would meet and relieve. These once mastered, we shall be far better able correctly to treat cardiac diseases.

Cactina and convallaria seem to have faded from their former place. The circulatory depressors, the nitrites, and the iodides, are still to be used with a careful hand lest we unwittingly mar and block Nature's curative efforts. Strophanthus seems to have gained in

favor of late, possibly because its powers for evil are less active than those of digitalis.

The Council of Revision of the Pharmacopœia has recommended the elimination of 154 articles from the next edition, which will still leave about 850, twenty per cent. of which are peculiar to the United States Pharmacopœia.

Diphtheria Antitoxin.—One of the drawbacks attending the use of antitoxic serum in diphtheria and other infections is that in a certain proportion of cases the treatment gives rise to a group of untoward symptoms, which Pirquet and Schick originally described under the name of "serum sickness." This has been found to be due to the serum itself and occurs in about thirty-three per cent. of the cases. The usual symptoms are fever, a rash, generally of an urticarial nature, and more or less pain and swelling about the joints. This reaction appears in from one to three weeks, and, while unpleasant, is not often dangerous. Occasionally, however, the reaction is more severe and is manifested by dyspnœa, cyanosis, and collapse. Such violent reactions sometimes occur within a few minutes or few hours after a first injection and may prove fatal. Gillette has collected 30 cases of this kind, 16 of which were fatal. Persons who are given serum a second time usually show the symptoms of reaction earlier, but otherwise the process runs just as harmless a course in these reinjected patients as after the first injections. This behavior of the reinjected patients indicates a special condition of the organism which was first observed in immunized animals by Behring, and was spoken of as hypersensitiveness and later as anaphylaxis (Richet). Serious anaphylactic attacks are rare in man and afford no reason for abandoning serum injections in diphtheria. In a recent discussion of the subject before the American Pediatric Society (*Jour. Amer. Med. Assoc.*, July 8, 1911), it was pointed out that in the large hospitals of New York and Philadelphia evidence of anaphylaxis, except of mild degree, had not been observed, notwithstanding the very extensive use of the serum. Goodall (*Brit. Med. Jour.*, Feb. 11, 1911), however, believes that the indiscriminate use of serum as a prophylactic is unjustifiable, although he thinks there are outbreaks of diphtheria in institutions for the care of children in which the use of antitoxin as a prophylactic, given cautiously and after due inquiry into the child's life history, may be justified. In this connection it is note-

worthy that asthmatics, hay-fever sufferers, and persons susceptible to the odors of horses are the ones most likely to suffer from anaphylactic shock. Twenty-two of the patients in Gillette's series were subject to asthma in some form or other.

Dzerjgowsky (*Jahrbuch für Kinderheilkunde,* July, 1911) has devised a method of inducing immunization which seems to be promising. A wad of cotton impregnated with diphtheria toxin is introduced into each nostril alternately for half an hour each day for ten days. In experiments on adults and 17 children it was found that there was marked production of antitoxin by this method and that the immunity thus acquired may last for months and years.

Another plan that has been suggested to prevent serum sickness in diphtheria is to administer the antitoxin by the mouth. According to Cumberlege (*Brit. Med. Jour.,* July 16, 1911), the action of the remedy when given in this way is little slower, if any, than when it is given by injection. His usual practice is to give an initial dose of 2,000 units, and to repeat this dose if necessary. He has never noticed rashes or joint pains after the oral administration of the serum.

Pospischill and Eckert have reported saving apparently hopeless cases of diphtheria by enormous doses (50,000 units) of antitoxin given intravenously, and Morgenroth has reported similar good results from the intramuscular method. In a series of 325 cases reported by Hoesch (*Deutsch. med. Woch.,* 1911, xxxvii, 1683), part treated by the intravenous, part by the intramuscular method, there were 52 deaths, or 16 per cent. Much quicker results on the fever, pulse, and membrane are claimed for these methods of administration. With the possible exception of nasal diphtheria, Hoesch found no better results from the intravenous than from the intramuscular method, and, as the former is often impossible of application, the latter method of late has been the proceeding of choice.

It is well known that convalescent patients and healthy carriers not infrequently harbor the diphtheria bacillus in the nose or throat for several weeks and that the ordinary methods of throat antisepsis in such cases are far from being satisfactory. Catlin, Scott, and Day (*Jour. Amer. Med. Assoc.,* Oct. 28, 1911) have found that spraying the nose and throat two or three times daily with a twenty-

four-hour-old bouillon culture of *Staphylococcus pyogenes aureus* was speedily followed by a disappearance of all diphtheria organisms and proved entirely harmless. This method of treatment was first introduced by Schiotz (*Ugesk. f. Laeger,* lxxi, No. 50, 1910).

Antityphoid Vaccination.—The latest reports of surgeons in the United States Army add more evidence to the already overwhelming testimony in favor of the protective value of antityphoid vaccination. This procedure was introduced in the army in March, 1909, and up to October, 1910, over 17,000 men were vaccinated (*Naval Med. Bull.,* April, 1911). Among the vaccinated men five cases of typhoid have occurred (*Annual Report, Surgeon-General U. S. Army,* 1910), as against 418 among the non-immunized. Moreover, of these five cases four were so mild as to leave doubt as to the diagnosis, and there were no bad effects of any kind as a result of the vaccination.

The local reaction consists of a somewhat red and tender area at the point of inoculation, which usually disappears in from two to three days. Compared with the typhoid morbidity and mortality at Jacksonville, Florida, in 1898, the results at San Antonio during the recent mobilization of troops on the Mexican border, show the extent of the advance (Kean, *Jour. Amer. Med. Assoc.,* 1911, lvii, 713). Among 8,097 vaccinated men at San Antonio there was only one case of typhoid, whereas in Jacksonville, among 10,759 men, there were 1,729 certain cases of typhoid (including probable cases, 2,693), of which 248 resulted fatally.

Fletcher (*Jour. Amer. Med. Assoc.,* 1911, lvi, 1016) describes in detail the method of administering antityphoid vaccines in the United States Army. In brief, the method consists in making three subcutaneous injections at ten-day intervals of a killed culture of *Bacillus typhosus.* The vaccine is contained in sealed ampoules, the standard content being 1,000,000 dead bacilli per C.c. The injections are made in the posterolateral aspect of the arm, the initial dose being 0.5 C.c. and the two succeeding doses 1 C.c. each.

The testimony in favor of the treatment of typhoid fever by vaccines is less convincing, although, on the whole, it is favorable. Meaking and Foster (*Canadian Med. Assoc. Jour.,* June, 1911) compare the results obtained in 41 cases treated by vaccines isolated

from the blood of typhoid patients with cases under the same conditions not so treated. The average length of fever in the uninoculated was 37 days, as against 28 days in the inoculated. Complications developed in 42 per cent. of unvaccinated and in only 5 per cent. of the vaccinated, while the mortality was 10 per cent. in the former and only 2.4 per cent. in the latter. From one to three injections were given, the dose ranging from one thousand million bacilli to two thousand million. T. Callison (*Medical Record,* June 24, 1911) also reports favorably upon the treatment. In 214 collected cases the mortality was 5.6 per cent.

Autoserotherapy, to which attention was directed last year (see INTERNAT. CLINICS, vol. i, ser. 21, p. 230), has been further tested by N. Chigayieff (*Russki Vrach,* 1910, 51) in 56 cases of serous pleurisy. Briefly, this treatment consists in the withdrawal by means of a syringe of 1 to 3 C.c. of the pleural fluid and immediately injecting it under the skin of the back. Of 56 cases in which Chigayieff essayed the treatment, failure occurred in 6, the results were unsatisfactory in 8, but rapid absorption followed in 42. The injections appear to have been entirely harmless and have caused little or no reaction. H. Arnsperger (*Therapie d. Gegenwart,* 1911, No. 11) has obtained very good results in 11 cases of serous pleurisy by supplementing serotherapy with the injection into the pleural sac, after the fluid has been aspirated, of 150 to 600 C.c. of nitrogen. The object of the treatment is to keep the pleural surfaces apart and check further production of effusion and adhesions.

Immunization in Leprosy.—It is almost three years since Clegg (*Philippine Jour. Sci.,* 1909, iv, 403) first announced the successful prolonged cultivation of the bacillus of leprosy on artificial media, and Duval (*Jour. Exp. Med.,* 1910, xii, 649; 1911, xiii, 365) since then has devised methods that make the proceeding comparatively simple. Success in animal inoculation has advanced almost equally with the progress in artificial cultivation of the organism.

Quite recently Duval (*Jour. Exp. Med.,* 1911, xiii, 374), by successive injections of a pure culture of the leprosy bacillus, succeeded in producing in the monkey a type of disease very similar to the human form and in reobtaining the organism from the remote lesions. In two of five cases the bacillus could be cultivated from

the nasal secretions—a fact which would appear to speak in favor of segregating measures in dealing with the subjects of leprosy. In a further communication on experimental immunity against the leprosy bacillus, Duval, Gurd, and Hopkins (*Jour. of Infectious Diseases,* 1911, No. 3) present evidence to show that the proper administration of the *B. lepræ,* whether the protein extract or the whole killed bacilli are used, will not only ameliorate the condition of the leper, but in early cases will bring about a cure. In none of the cases treated by these observers with leprosin have new lesions developed after the local reaction was obtained, and in early cases there has been a complete subsidence of all signs of the disease in from four to six months after systematic treatment has been carried out. Crow (*Naval Med. Bull.,* Jan., 1912) has examined the blood of a large number of the lepers in the colony at Guam and concludes that the *Bacillus lepræ* may be found in the blood of lepers in 80 per cent. of cases, and possibly in all cases if sufficient care and diligence are used in the examination. He used elaborate precautions to exclude bacteria from the distilled water or other extraneous source.

Two New Flexner Serums.—In spinal meningitis (epidemic) and in infantile paralysis Dr. Flexner seems to have established the value of two more serums that reduce the mortality by a large percentage. So much for going back to the monkey from whom some think we originally came.

Gonorrhœa.—The complement fixation test for this disease, as devised by Schwartz, has been found to be remarkably accurate and a most valuable means of diagnosis (Keyes, *Amer. Jour. Med. Sci.,* Dec., 1911). Too much must not be expected of it in early or mild cases, as it records the reaction in the blood to an inflammation which is often very localized and superficial. Also, if it becomes very marked and persists, it may continue for an indefinite time after the gonococci have disappeared.

Fats and Oils Subcutaneously in Wasting Diseases.—The results obtained by Mills and Congdon (*Arch. of Int. Med.,* 1911, vii, 694) in experiment work upon the utilization of fats and oils given subcutaneously suggest the application of such injections to the treatment of wasting diseases, especially tuberculosis, in which

the intolerance to fats given by the mouth is almost symptomatic. These observers have found that olive, peanut, cocoanut, cottonseed, and lard oils, and unsalted butter-fats made into emulsions with 3 to 5 per cent. of egg lecithin and water, are permanent and can be given hypodermically over a considerable period without local irritation, provided aseptic care is used and precautions are taken to avoid injections into the blood stream. If the emulsions are injected during starvation they are absorbed in amounts sufficient to furnish from one-half to two-thirds of the full calorific requirement of the animals injected.

Hexamethylenamine.—A few years ago Crowe and others showed that hexamethylenamine taken by the mouth in large doses is eliminated not only in the bile, but also in the cerebrospinal fluid and the secretions of the respiratory tract. This fact has led to a trial of the drug in coryza, bronchitis, and affections of the pleura. A. Miller (*Jour. Amer. Med. Assoc.,* June 10, 1911) has found that it acts promptly and efficiently in coryza when given in doses of 15 grains, well diluted, four times a day. F. Shattuck (*Boston Med. and Surg. Jour.,* June 15, 1911) has used the drug in 59 cases of lobar pneumonia with the view of preventing empyema and other complications. The dose was 10 grains three times a day. Of this series of cases three developed empyema, but neither pericarditis nor otitis media was observed. Of 188 cases previously treated without hexamethylenamine, pericarditis occurred in 4 to 5 per cent. and otitis media in 3 to 4 per cent.; but in only four of these cases was there empyema. The mortality in cases treated with hexamethylenamine was 20 per cent., and where it was not used the mortality was 25.5 per cent. Shattuck believes that his results are not sufficiently encouraging to inspire the hope that in hexamethylenamine we have a preventive for empyema. They do suggest, however, that the drug may be of some service in preventing pericarditis and otitis, although it may have been a mere coincidence that neither of these complications developed in the hexamethylenamine cases.

Some favorable reports of its use in middle-ear diseases have appeared; this use of the drug is based on the fact that it is excreted to some extent by the lining membrane of the middle ear.

Ipecac in Dysentery.—Experiments carried out by Vedder (*Bull. Manila Med. Soc.,* March, 1911) afford some explanation of

the favorable action of ipecac in dysentery. This observer has demonstrated that ipecac, except in comparatively strong solution, has no power to inhibit the growth of dysentery bacilli, but that it has a powerful action *in vitro* on *Amœbæ*. The latter in a 5 per cent. bouillon culture were at all times killed by a fluid extract of ipecac in a dilution of 1 to 50,000, and sometimes killed by even higher dilutions, such as 1 to 200,000.

From the clinical standpoint the testimony in favor of the ipecac treatment of amœbic dysentery is very strong. In a series of 21 patients with dysentery treated by ipecac, Brem and Zeiler (*New Orleans Med. and Surg. Jour.*, July, 1911) report that the amœbic infection was eradicated in twelve cases that were followed, with frequent examination of stools, for from one to fifteen months. The infection was apparently eradicated in eight others, followed less than one month. In only one instance of amœbiasis with dysentery was the treatment unsuccessful. Failure also occurred in four cases of amœbiasis without dysentery, but in these the treatment was not satisfactorily carried out. Two cases reported by Brem and Zeiler indicate that when ipecac fails when given by the mouth, success may attend its administration per rectum or through the appendix after appendicostomy. In using the treatment, Vedder points out that care should be taken to obtain ipecac that contains the proper amount of emetin, and, where analysis is impossible, to insist on the Brazil root.

Magnesium Sulphate in Erysipelas.—Three years ago we drew attention to the value of the external application of magnesium sulphate in the treatment of erysipelas, as advocated originally by Tucker (*see* INTERNAT. CLINICS, vol. i, ser. 19, p. 204). A saturated aqueous solution of the salt is employed on from fifteen to twenty thicknesses of ordinary gauze, of sufficient size to extend well beyond the area involved, and covered with oiled silk or wax paper. The dressing is wetted with the solution as often as necessary to assure moisture. Since the publication of Tucker's paper many favorable reports of the treatment have been made. Recently Choksy (*Lancet*, 1911, clxxx, 300) has demonstrated its value in 72 cases of erysipelas. In almost every instance the effects of the application were beneficial.

Oil of Camphor in Peritonitis.—Notwithstanding the great

progress which modern surgery has made in the treatment of abdominal disease, purulent peritonitis still remains a deadly malady. Hence, suggestions are frequently made urging the use of various chemical agents in addition to saline irrigations. Krecke of Munich (*Zentralbl. f. Gynäk.,* 1911, No. 21) recommends oil of camphor for this purpose and claims excellent results. He treated with complete success eleven cases of acute general purulent peritonitis, all following rupture of a sloughing appendix. The time elapsing between the development of the disease and the institution of treatment ranged from eight to eighty hours, the age of the patients from ten months to seventy years. The abdominal cavity was quickly opened, the appendix amputated, the pus wiped away, and then 100 C.c. of a 1 per cent. sterile solution of oil of camphor was poured into the peritoneal sac and carefully distributed over the entire membrane by means of gauze sponges. Then the abdominal cavity was closed and a rubber tube holding a strip of gauze was placed in the wound.

In discussing Krecke's paper, Schläfli stated that very strong solutions are used at Basle. Von Herff introduced from 30 to 50 C.c. of a 10 per cent. solution of oil of camphor into the peritoneum in 53 cases where the membrane was infected before operation, and in all but one case recovery ensued. Burckhardt has proved that streptococcal infection of the peritoneum in white mice after injection of oil of camphor seemed to be completely inhibited, although other infected mice not treated with the camphor oil died rapidly with all the symptoms of fulminating peritonitis.

Pituitrin.—The organotherapeutists are leaving no stone unturned in their search for new and effective remedies. One of the most recent products of the ductless glands is pituitrin, a proprietary extract of the pituitary body. It is claimed to have a direct effect on the arterial muscular coat—in contrast to adrenalin, which affects the vasomotor centres—causing the arteries to contract and thus raising the blood-pressure. The drug has been used in osteomalacia, acromegaly, and postpartum hemorrhage. It has the power of strengthening the contractions of the uterus and may prove to be a valuable substitute for ergot.

Kaolin.—Zweifel has reported four cases of tetanus following

the application of this drug as a prophylactic against suppuration in inflammation of the umbilicus.

Radium.—As a therapeutic agent radium still holds the distinction of being the most expensive of drugs, though it is now planned to have a central depository from which the metal may be loaned or leased for each treatment, thus greatly reducing the cost. As a small quantity of radium can be used indefinitely this arrangement may make its use more general than was heretofore practicable. The exact amount and length of time during which treatment should be continued have not as yet been ascertained. In malignant disease it has been chiefly used to prevent a recurrence after excision, and as a means of retarding the disease in inoperable cases.

Salvarsan.—During the past year reports on the action of salvarsan ("606") have dominated medical literature to such an extent that it is impossible to give more than a brief summary of them here. With certain reservations, the general results of the continued observations with this drug agree with those expressed in the earlier articles. The large majority of authors speak of extraordinary symptomatic improvement and of rapid disappearance of threatening signs. The evidence shows unmistakably that we have in salvarsan a remedy with a definite influence on syphilitic processes, primary, secondary, tertiary, and congenital. Ehrlich's hope of *therapia sterilisans magna*—a cure at one stroke—has certainly not been realized—save, perhaps, in exceptional cases—but it is impossible to avoid the conclusion that a great advance has been made in the treatment of syphilis. As to the duration of the good effects of the drug, no one is in a position, at present, to speak dogmatically. Relapses have occurred apparently in from 5 to 15 per cent. of the cases that have been carefully observed. According to Meltzer (*Jour. Amer. Med. Assoc.*, June 10, 1911), the effects of salvarsan differ from those of mercury in the following points: it destroys all spirilla, whereas mercury affects only the spirochætæ of syphilis; it apparently produces antibodies, as is shown by the effectiveness of the serum and milk of those who have been injected with it; its action is much more rapid than that of mercury; and, finally, whereas mercury causes more or less cachexia, salvarsan tends to increase the weight of the patient.

While the indications for the use of salvarsan cannot be absolutely formulated, it is generally agreed that fresh cases of syphilis should be given the benefit of the treatment, unless there is present some definite contraindication, and, as Goldenberg and Kaliski (*Amer. Jour. Med. Sci.,* March, 1911) point out, the remedy is especially indicated in cases of malignant lues, those refractory to mercury or having an idiosyncrasy to it, and in patients with gummata of vital and important structures, where a rapid dissolution of the lesion is necessary to save life or prevent marked destruction of tissue. The contraindications for salvarsan treatment as originally given by Ehrlich (*Münch. med. Woch.,* 1911, lviii, 1) include irritable heart from nervous causes, organic heart-disease, vascular degenerations, old cases of cerebral hemorrhage, aneurisms, and advanced age. To these he has recently added serious nephritis, advanced diabetes, and ulcer of the stomach. The most important of these is undoubtedly cardiovascular disease (myocarditis with aortitis and coronary sclerosis). After carefully analyzing the fatalities following the injection of salvarsan, Martius, of Ehrlich's Institute (*Münch. med. Woch.,* 1911, lvii, 20), concludes that no unfavorable influence on the sound heart from the drug need be anticipated, even with intravenous injection, if the dose is small, not over 0.3 Gm., and if it is copiously diluted, and care is taken that the reaction of the solution is not acid.

It is generally agreed that the intravenous method of treatment is the least objectionable and gives the best results. The local dangers which occur in connection with subcutaneous and intramuscular injections, but not with intravenous when properly performed, include injury to large nerve-trunks, puncture of large blood-vessels, embolism, local necrosis, and ulceration. A general reaction follows intravenous injection in a certain number of cases and consists usually of chill, high fever, herpes, vomiting, diarrhœa, and albuminuria. These symptoms have been ascribed to the inherent toxicity of the drug, but Wechselmann (*Deutsch. med. Woch.,* 1911, xxxvii, 778) has recently suggested that they may be due to contamination of the distilled water used for the solution with saprophytic micro-organisms. Since he has adopted the plan of distilling and sterilizing the water immediately before treatment no further

reactions have been noted. The correctness of Wechselmann's observation has been confirmed by Swift and Ellis, of the Rockefeller Institute (*Jour. Amer. Med. Assoc.,* Dec. 23, 1911). They find that the preparation of salvarsan with freshly distilled and sterilized water eliminates practically all toxic reaction.

Apart from the untoward effects to which attention has already been drawn, the only disturbing results that have been reported after the use of salvarsan are occasional inflammation of cranial nerves, particularly the optic and auditory nerves. Relative to the number of cases treated, the incidence of such complications has been very small, probably not more than one in a thousand (Schamberg). They have occurred almost exclusively in cases of recent syphilis, and very rarely after intravenous administration. It is well known that inflammation of cranial nerves may occur spontaneously in syphilis, and it is doubtful whether the incidence is larger after salvarsan than after mercury. Ehrlich states that salvarsan has no bad effects on the eye, and many observers have reported excellent results from the use of the drug in the treatment of syphilitic conditions of ocular structures, including the retina. In some instances, as in one of Finger's cases, optic neuritis was undoubtedly due to previous arsenical treatment (arsacetin, enesol) and not to the salvarsan. Ehrlich repeats the warning that salvarsan should not be given to a patient who has had other arsenical treatment.

Many have written enthusiastically of the results following the use of salvarsan in sleeping sickness, malaria, kala azar, relapsing fever, yaws, Vincent's angina, gangosa, filariasis and pellagra, but sufficient work has not been done to justify any conclusions as to its value in these conditions.

Syphilis.—Noguchi has reported the first successful effort to reproduce syphilitic lesions by injecting pure culture of the *Treponema pallidum,* thus proving this to be the specific organism of the disease. In the serum diagnosis of the disease it has been shown that the antigen is not necessarily specific and that extracts of syphilitic liver are not necessary, since the blood-serum of patients with syphilis will, in the presence of complement, fix this when mixed with alcoholic extracts of normal organs or crude tissue lecithins. It is reported by Craig and Nichols (*Jour. Amer. Med. Assoc.,* Aug. 5,

1911) that the strongest Wassermann reaction may be rendered negative by the ingestion of alcohol, and may remain so for days.

The Salicylates in the Treatment of Rheumatism.—That the salicylates have a distinctly favorable, if not a specific, action in rheumatism is so universally believed that considerable evidence would seem necessary before these agents are discarded. Recently, Menzer (*Zeit. f. Hyg. u. Infectionsk.,* 1911, lxviii, 296) has published an article, based on his experience as a German army surgeon, questioning their efficacy. He does not dispute the fact that judicious administration of salicylates may afford some relief, but in his experience patients so treated were much more subject to recurrences, and in particular to deforming arthropathies, than were those handled without the use of salicylates. It seems probable, from Menzer's account of his cases, that many of them were not in reality examples of rheumatism, but rheumatoid arthritis, a disease over which the salicylates are acknowledged to have little, if any, control.

It cannot be denied that the salicylates have many objectionable properties, and any suggestions as to methods of administration intended to obviate their irritant effect on the stomach and kidneys, for instance, are naturally welcome. Glaesgen (*Münch. med. Woch.,* 1911, No. 21) presents experimental evidence to show that the administration of an alkali in conjunction with the salicylates, in sufficient amount to render the urine alkaline, is quite effectual in preventing albuminuria and in no way lessens the therapeutic action of the latter. As a rule, twice as much of the alkali as of the salicylate was necessary to accomplish the desired effect.

Seifert (*Medical Record,* 1911, lxxix, 432), advocates for the treatment of rheumatism the hypodermic injection of 10 C.c. of a 20 per cent. sterilized solution of sodium salicylate to 100 pounds of body weight. The injections are given every twelve hours and are made fifteen minutes after the injection of an appropriate cocaine solution in order to deaden the pain. No untoward effects were noted in Seifert's cases. Jackson (*New York Med. Jour.,* June, 1911) reports excellent results in rheumatism from the intramuscular injection of magnesium sulphate. He employs a 25 per cent. sterilized solution and injects 4 C.c. into adults. He has not yet noted

any unfavorable signs from the treatment despite the fact that magnesium sulphate injected into the circulation is an active cardiac and respiratory depressant. It would be well not to expect too much from the use of either sodium salicylate or magnesium sulphate hypodermically; at any rate, it would be advisable to wait the further investigation of both of these methods of treatment by others.

SURGERY

Shock.—The work of Yandall Henderson has thrown new light on the relation between anæsthesia and surgical shock and is having a strong influence on the direction of the active search for new and better means of anæsthesia. Martin (*Jour. Amer. Med. Asso.,* Sept. 30, 1911) reviews the subject and gives his reasons for advocating rebreathing in anæsthesia. He believes that shock is primarily due to a lack of carbon dioxide in the blood and tissues (acapnia), and suggests that some of our technic of to-day is based on wrong principles; carbon dioxide is likened to a hormone in its function as a chemical regulator of respiration, and a marked diminution of it in the blood creates a lack of the normal stimulus to the respiration. Excessive artificial respiration for thirty minutes in dogs is followed by a cessation of respiration, due to a greatly increased pulmonary ventilation; the heart fails for lack of oxygen and acidosis occurs, due to accumulation in the blood of the products of incomplete tissue combustion; the administration of the carbon dioxide during this cessation of respiration causes immediate return of natural respiration; the respiratory excitement during the first stage of ether is similar in effect and predisposes to later respiratory failure. Applying these principles further to anæsthesia, Martin finds that rebreathing makes the rapid pulse slower and increases the tension, also the rapid respiration becomes slower and deeper. For this the term autostimulation is coined.

Anæsthetics.—Bevan (*Surg. Gyn. Obstet.,* Aug., 1911) sums up the present status of the anæsthetics as follows: for routine work ether by the drop method is the safest and most satisfactory in 75 to 80 per cent. of cases; chloroform is indicated in exceptional cases, while nitrous oxide is the choice for short operations and examinations, also for patients with bad kidneys, typhoid perforations, or

peritonitis. Spinal anæsthesia has no place. The use of narcotics preliminary to general anæsthesia is deprecated for the reason that the benefit is not great enough to justify the risk.

Hedonal.—Intravenous anæsthesia by this agent is still under discussion, but has not been widely adopted; some favorable reports of its use have come from the Russian clinics.

Ether.—The intravenous use of ether is still in the experimental stage; operations over two hours long have been performed under its influence, and it has replaced hedonal with some operators. Rectal anæsthesia with ether has made little headway. Elsberg has had excellent results with the intratracheal insufflation method of etherization, and recommends it as a simple method of avoiding the dangers and difficulties which accompany anæsthetization in operations on the thorax, jaw, brain, and cord. Similar reports from others who have used it in many cases indicate that this method is of real value and will be widely used in certain classes of cases.

Nitrous oxide anæsthesia is now much in use for major operations of every type. In those cases where it is desirable to secure relaxation of the abdominal walls, a few drops of ether, usually not more than a drachm, may be administered, as by this means the patient leaves the operating table in a conscious condition and the after-effects are practically *nil.*

Decapsulation of the Kidney.—Although several years have elapsed since decapsulation of the kidney was first advocated as a means of treating nephritis, and numerous operations on human beings have been reported, the great body of the profession still looks askance at it as a routine measure. The cause of the improvement sometimes observed after the operation, according to Edebohls, who reported 14 cures out of 72 cases operated on, is an "arterial hyperæmization of the kidney," resulting in the regenerative production of new epithelium capable of carrying on the secretory function of the organ. Few observers have been able to obtain results as good as those claimed by Edebohls, and some have been very outspoken in their condemnation of the procedure; nevertheless, it seems to be capable of affording considerable relief in certain conditions. On the whole, the results appear to have been most favorable in the cases of chronic nephritis attended by severe renal pains or those in

which there was considerable bleeding, practically limited to one side.

According to Tyson (*Medical Record,* July 8, 1911), who has reported four cases in which decapsulation was done with excellent results, so far as the improvement of health and ability to work were concerned, the operation is demanded by stubborn persistence of symptoms which cause inconvenience or endanger life, such as dropsy, uræmia, anuria, and excessive albuminuria.

It is generally admitted that the operation should not be considered until medical treatment has failed, and that it is absolutely contraindicated by age, valvular heart-disease, extensive cardiovascular changes, albuminuric retinitis, etc. Koplik (*Jour. Amer. Med. Assoc.,* June 17, 1911), from a limited experience with decapsulation, concludes that, while the operation is not curative, it does not endanger life, and often affords freedom from symptoms, lasting in some cases for a period of years. In a case cited by Peabody (*ibid.*) decapsulation was done four times in a period of two years, each operation being followed by marked improvement lasting several months.

Gastric and Duodenal Ulcer.—The prognosis of gastric ulcer and of duodenal ulcer, as regards the percentage both of the mortality and of the curative effect of treatment, is still difficult to determine. A mass of statistics is available, but in many respects these statistics are insufficient and misleading. Musser concludes that the mortality from ulcer treated medically, if both hospital and private patients be considered, is about 8 per cent. Lockwood's experience (*Jour. Amer. Med. Assoc.,* April 1, 1911) coincides very closely with this figure, the general mortality in 175 cases in private practice and 84 in hospital practice being about 7 per cent. Of the patients treated rigidly for ulcer and followed for over three years, 66.6 per cent. were clinically cured, 16.6 per cent. relapsed, leaving 50 per cent. permanently cured; 22.2 per cent. were improved; 5.5 per cent. were unimproved, and 5.7 per cent. died (not, however, as the result of the ulcer).

Lockwood concludes that there is no such thing as an exclusive medical treatment, nor can it be affirmed that ulcer is purely a surgical disease; but while some ulcers are to be treated medically, and

others call imperatively for surgical treatment, the majority are grouped near the borderland. Acute, uncomplicated ulcers are best treated medically. This is conceded by all surgeons. Chronic, uncomplicated ulcers should not be regarded as surgical until, after a rigid and systematic course of treatment, symptoms persist or recur. No treatment can be considered efficient that does not include rest in bed for at least three weeks. If, after vigorous medical treatment, the symptoms persist or relapses occur, surgical intervention is indicated. The mortality rate and the percentage of cures are both on the side of surgery in these cases. Exploration is demanded, without loss of time, in all cases in which there is a suspicion of malignancy, in recurring hemorrhages, especially if the continued loss of blood occasions a progressive anæmia; in perforation, and in pyloric obstruction, hour-glass contractions of the stomach, or persistent adhesions which interfere with the proper drainage of the stomach.

Mayo (*Annals of Surgery,* Sept., 1911) controverts three preconceptions regarding ulcer of the stomach and duodenum. In the first place, chronic benign ulcer is *not* so much more common than duodenal ulcer as is supposed. Of 1,000 cases in his series, 428 were classified as gastric (including all the ulcers around the pylorus, which really are duodenal) and 572 as frankly duodenal. In the second place, it has been almost universally accepted that benign ulcer is more common in women than in men. In Mayo's 1,000 cases, 255 were women and 745 were men. In the third place, it has been alleged that multiple ulcers are the rule, but Mayo has found that, while this may be true of acute toxic ulcers, it is not so of chronic ulcers, more than 95 per cent. of the latter being single. Mayo concludes, from his extensive experience, that the treatment of all duodenal ulcers and all obstructing ulcers of the pyloric end of the stomach by gastrojejunostomy and excision or infolding of the ulcer is satisfactory, and gives 98 per cent. of cures or great improvement; that 85 per cent. of the body of the stomach will either be cured or greatly relieved by excision or devitalizing suture compression with gastrojejunostomy. The remaining 15 per cent. will be more or less benefited. The mortality of the surgical treatment of chronic gastric and duodenal ulcer is well under 2 per cent.

Fistula in Ano.—MacKenzie submits an operation for this con-

dition without mutilation of the sphincter. It consists of reflecting a flap, including skin and muscle, right down to the fistula and removing the fistulous tract and all doubtful tissue (*Annals of Surgery,* Sept., 1911).

Pancreatostomy.—Link proposes this operation in all cases of chronic pancreatitis not relieved by gall-bladder drainage, and particularly in pancreatitis accompanied by stone formation in the pancreatic duct. He brings the tail of the pancreas out through the mesocolon and sutures it to the skin with a small tube in the duct of Wirsung, establishing permanent drainage.

Abdominal Nerves.—Hoguet (*Annals of Surgery,* August, 1911) calls attention to the importance of preserving the nerves of the abdominal wall in doing laparotomies, and reports a group of cases of right inguinal hernia following injury to the abdominal nerves; they are particularly likely to occur in cases in which the wound had been drained.

Varicose Veins.—Hesse and Schaak report 48 cases in which the cut end of the saphenous vein was anastomosed into the side of the femoral low enough down to secure the support of the column of blood by the valves in the femoral; their results were very favorable and the relief was rapid.

Open Treatment of Fractures.—The open treatment of fractures has been widely discussed and one of its enthusiastic advocates has advised its use in every case of fracture, however simple; few operators go to this extreme, and the idea has been expressed that its use is far too common in view of the difficult technic sometimes involved and the grave results if infection occurs. Then, too, the plate may become loosened by actual wear and tear, and then have to be removed later on, a routine practice performed by some surgeons within six months of the first operation.

Lipectomy.—This operation, suggested some years ago and so well described by Dr. Anspach, in his article in the second volume of the twenty-first series, has recently been performed in a number of cases for the relief of pendulous abdomen. The fat in excess fails to perform the function for which it is intended and becomes a burden. Castle has reported the removal of as much as sixty-five pounds in one case by the operation and the starvation required by it.

Transplantation.—A noteworthy advance is being made in the field of reconstructive surgery by the successful replacement of a diseased or injured organ by a sound one from another body; the vessels are anastomosed and the transplanted organ takes up its physiological duties in its new home without apparently recognizing the difference of location. So far the procedure has found its greatest use in ovarian grafting, though it has been found that in some cases the ovarian tissue atrophies and finally disappears. We print in this issue of the CLINICS a case of transplantation of the human testicle (p. 150).

Transplanting Fascia.—Davis has transplanted free fascia flaps successfully into subcutaneous tissue, fat and muscle; on to periosteum, bone, tendons and ligaments; the flaps were apparently healthy and retained their microscopic structure over prolonged periods; some were kept for thirty-five days in cold storage before being implanted. He suggests their use to bridge muscle or tendon defects, to cover raw surfaces of organs or to sling ptosed kidneys to the ribs. The material can be taken without harm from the fascia lata.

Skin Sterilization.—The use of iodine in the preparation of the skin for surgery continues to grow in favor; first recommended for use in surgery during the Civil War, its long quiescence has been followed by almost universal adoption because of its simplicity, cheapness, and efficiency. Several theories of the nature of its action have been proposed, but none has been proved. The best monograph upon this subject is by Antonio Grossich (*Meine Präpartionsmethode des Operationsfeldes mittels Todtinktur*).

Picric Acid.—Tests of picric acid have shown it to possess strong germicidal powers. Mitchell, in *Annals of Surgery,* August, 1911, gives the following routine for its use in sterilizing the skin prior to operation: the abdomen is shaved, washed with soap and water, and a 1 per cent. alcoholic solution of picric acid is applied the night previous to the operation; this procedure is repeated just before the operation. In his cases there were no infections and no evidence of toxic action of the acid.

INDEX TO VOLUME I

(TWENTY-SECOND SERIES)

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